Part III: Detailed Narratives of Local Project Development Team Conservation Priorities and Actions

Part III of this plan addresses the issues identified by each Local Project Development Team (LPDT) and their past, current, and proposed conservation actions and projects at geographic priority areas where LPDTs intend to focus their work over the next five to 20 years. These locations range from narrow riparian areas along river reaches to entire watersheds and even larger areas such as aspen (*Populus tremuloides*) communities or sage-grouse (*Centrocerus urophasianus*) core areas. Part III of this plan is divided into four sections based on each Wyoming Landscape Conservation Initiative (WLCI) local project development team (Carbon, Lincoln/Uinta, Sublette, and Sweetwater). During the planning phase of this report, each team was responsible for identifying issues and predominant geographic areas where conservation actions and their interests would be focused over the next five or more years. Part III also provides the necessary project level details that will enable WLCI managers to evaluate the effectiveness of conservation actions at meeting each team's conservation objectives and landscape level priorities. Each LPDT section is divided by each geographic priority area and its environmental setting, conservation issues and actions, and its relationship to existing management plans and other actions. Some geographic areas are subdivided into smaller priority areas where similar issues and priorities are being addressed.

Part III will be updated annually based on accomplishments and annual reports. Each local team should review Part III annually to ensure the changes in priorities are reflected and that accomplishments not only by WLCI participants but also by other entities and organizations are comprehensively documented.

Carbon Local Project Development Team Priority Areas and Actions

The Carbon Local Project Development Team has identified eight geographic priority areas within Carbon County (figure 3-1). The Upper North Platte area is a large polygon that includes three smaller areas. These are the North Platte Riparian Corridor, Encampment River Riparian Corridor, and Platte Valley Mule Deer Initiative area. Since these three sub-priority areas share many of the same issues across the landscape, but have differing objectives to reach their goals, they were placed in the much broader heading as Upper North Platte. This priority area deals with maintaining and enhancing crucial habitats for big game and their migration routes; increasing age class structure and density of aspen, sagebrush (*Artemisia* spp.), and mountain shrub species; improving watershed function for the sport fish community; and has an invasive plant component. All eight priority areas need to control invasive weed species. LPDT members have identified objectives for many of the priority areas to improve vegetation for fish and wildlife species; sagebrush, aspen, mountain shrub, and riparian communities have been identified. Other priorities deal with movements of fish and wildlife; improving crucial habitats, connectivity, and corridors. All eight of these priority areas address all of WLCI's focal communities (Aspen, Aquatic, Sagebrush, Riparian, and Mountain Shrub) and landscape priorities (table 2-1) through either mechanical, chemical, biological, or a combination of the three methods. The team has identified flannelmouth suckers (*Catostomus latipinnis*), bluehead suckers (*Catostomus discobolus*), roundtail chubs *(Gila robusta)*, Colorado River cutthroat trout (*Oncorhynchus clarkii pleuriticus*), sport fish, elk (*Cervus canadensis*), mule deer (*Odocoileus hemionus*), sage-grouse, aspen and cottonwood (*Populus* sp.) trees as species expected to benefit from the treatments.

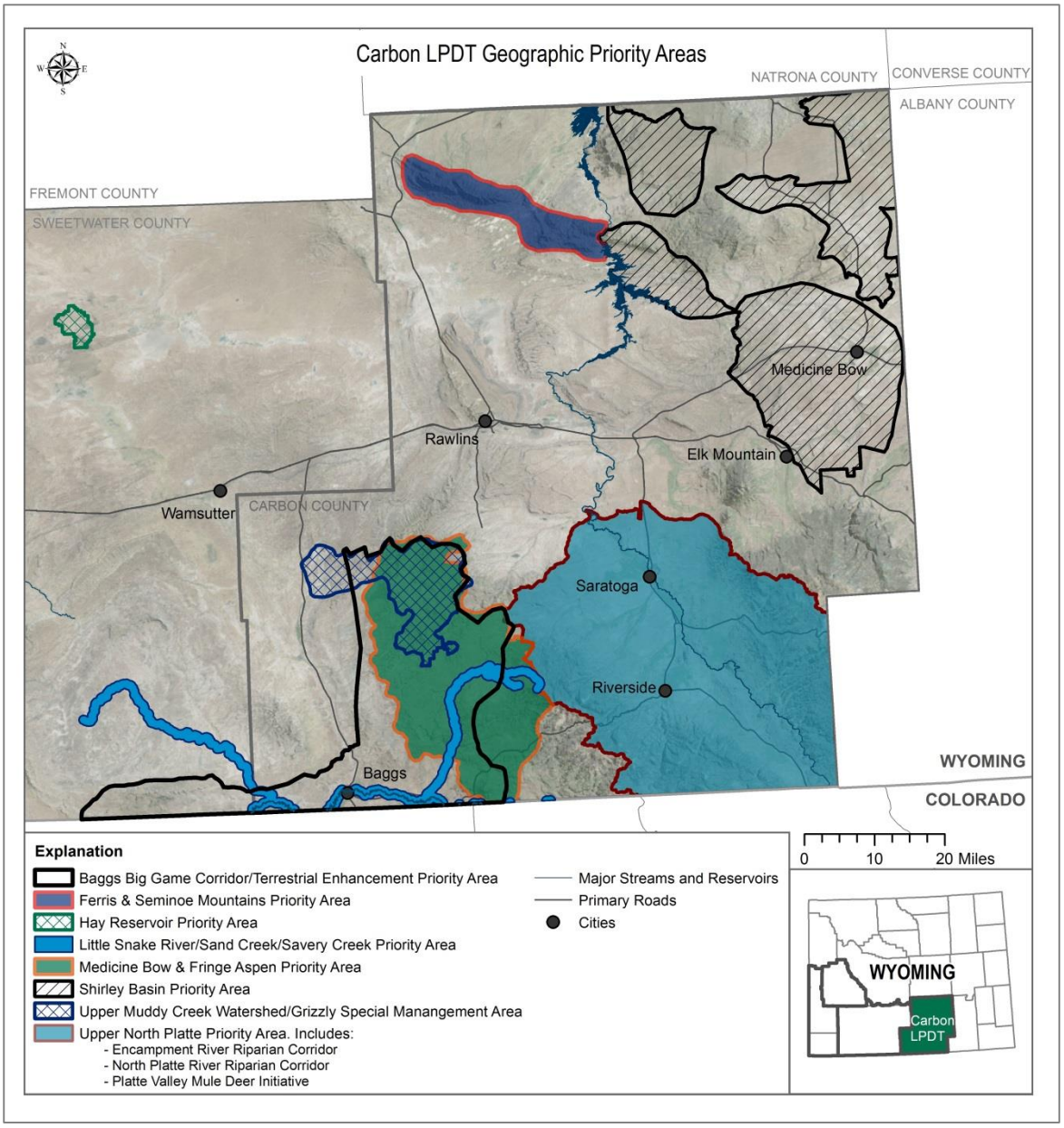

Figure 3-1**.** Carbon LPDT geographic priority areas

Baggs Big Game Corridor/Terrestrial Enhancement Geographic Priority Area

Environmental Setting

The Baggs Big Game Corridor/Terrestrial Enhancement Geographic Priority Area is predominantly located in southwestern Carbon County and extends west of Wyoming Highway 789 into Sweetwater County. The 557,560-acre area contains a great diversity of high elevation woodland, mesic shrub-steppe and xeric shrubland habitats. The west slope of the Sierra Madre Range consists of some of the largest contiguous acres of mature aspen communities in Wyoming. The area has been identified by Wyoming Game and Fish Department (WGFD) as a terrestrial enhancement priority in their Strategic Habitat Plan (WGFD, 2009), and is designated as crucial habitat. It contains a main migration corridor for mule deer and other big game species to the winter range in the Powder Rim area. It contains crucial winter range for mule deer and elk, sage-grouse core breeding areas, and habitats that support Columbian sharp-tailed grouse *(Tympanuchus phasianellus columbianus*) and numerous other Species of Greatest Conservation Need (SGCN). It overlaps portions of three other WLCI geographic priority areas: 1)

Medicine Bow & Fringe Aspen, 2) Little Snake River/Sand Creek/Savery Creek, and 3) Upper Muddy Creek Watershed/Grizzly Special Management Area. A variety of energy development projects have been proposed here, including major oil, wind, coal bed methane and natural gas development, and major energy corridors. The Baggs Big Game Corridor/Terrestrial Enhancement Geographic Priority Area has six different project activities (figure 3-2) which address the issues described below.

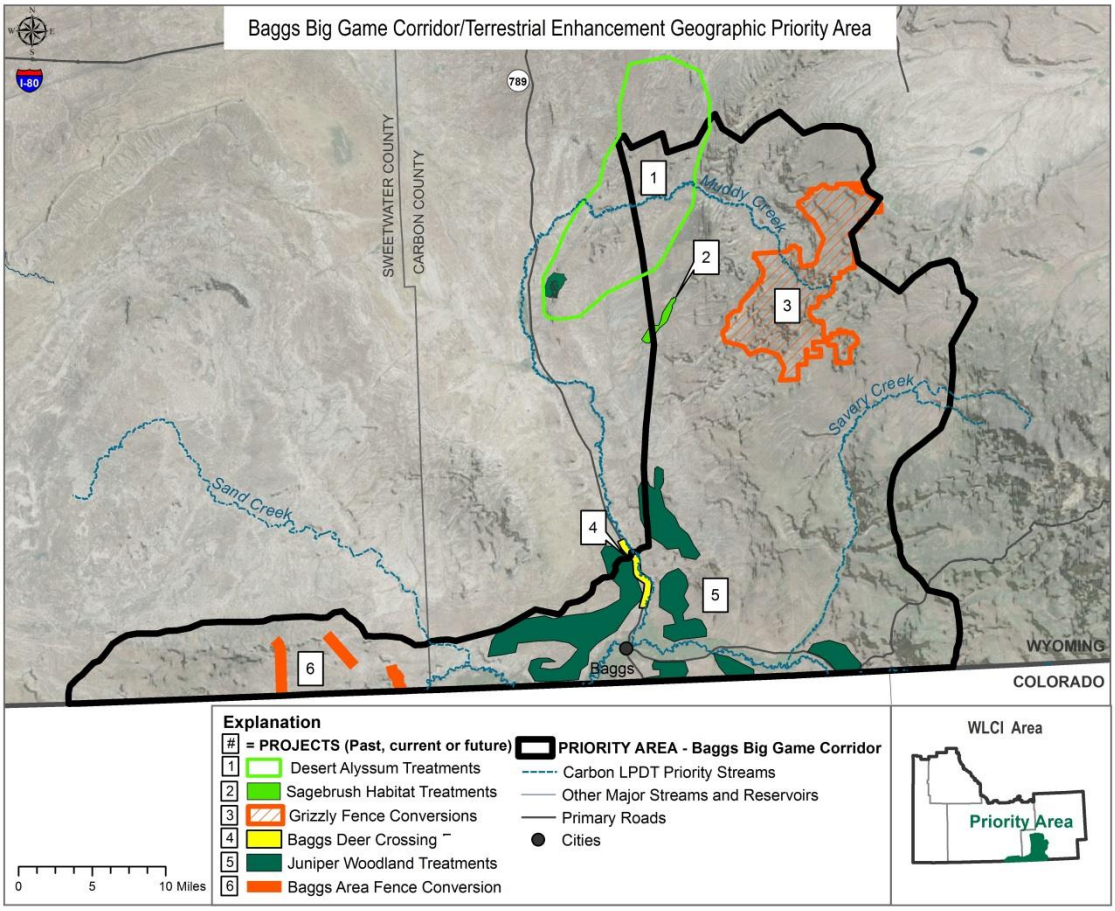

Figure 3-2. Baggs Big Game Corridor/Terrestrial Enhancement Geographic Priority Area and projects

Issues

- **Migration corridor maintenance and big game passage:** Research by Hall Sawyer utilizing GPS collars clearly demonstrates the barrier that Wyoming Highway 789 creates for migrating deer to access additional winter range. Excessive vehicle-wildlife collisions and mule deer mortality have been reported by WGFD along the highway. Non-wildlife friendly fencing impedes big game passage in the geographic priority area, causing wildlife stress, injury, and mortality. Existing fences on the Grizzly Wildlife Habitat Management Area (WHMA) impede big game migrations between transition season habitat and crucial winter range, as well as antelope *(Antilocarpa americana)* home range movements during summer months. WGFD has reported that existing fencing appears to act as a movement barrier to young mule deer fawn and elk calves attempting to utilize various rearing habitat on the Grizzly WHMA. Road density and subdivision development are growing concerns for the geographic priority area as well.
- **Declining mountain shrub and sagebrush communities:** Mountain shrub and sagebrush plant communities are declining in cover and production due to competition/encroachment by juniper *(Juniperus spp.)* and heavy browsing in mule deer and antelope crucial winter range. Shrub and other understory species are being lost in older juniper stands, replaced with bare ground and overland erosion.

- **Crucial winter range habitat degradation:** Approximately 40,000 acres of mule deer crucial winter range in the Baggs area on public land were evaluated in 2001 as not meeting rangeland health standards. Treatments to remedy this issue have been very small scale to date and greater attention is needed.
- **Invasive plant species:** Invasive plant species exist within the geographic priority area, and numerous species have been documented within the Sand Hills/JO Ranch Area of Critical Environmental Concern (ACEC) including Alyssum *(Alyssum spp.)* and Russian olive *(Elaeagnus angustifolia)*. Tamarisk *(Tamarix* sp.*)* invasion has been identified as an issue on Sand Creek, Willow Creek and their tributaries. Desert alyssum *(Alyssum desertorum)* and halogeton *(Halogeton glomeratus)* are reportedly competing with native vegetation within the Muddy Creek watershed. Monitoring transects in the area have shown a decrease in perennial plant spacing and production where alyssum dominates.
- This area overlaps three geographic priority areas, each with its own set of issues. See the narratives for Medicine Bow & Fringe Aspen, Little Snake River/Sand Creek/Savery Creek, and Upper Muddy Creek Watershed/Grizzly SMA geographic priority areas for details of additional issues.

Conservation Actions and Intended Outcomes

1. Inventory and Control of Desert Alyssum

The primary objective of this project is to inventory and initiate removal of desert alyssum and halogeton, which are reportedly competing with native vegetation in the Muddy Creek Watershed. Specific objectives include 1) chemically treating 2,000 acres, 2) inventorying 5,000 additional perimeter acres, and 3) monitoring 150 acres. The intended outcome of the invasive plant removal is improved or maintained habitat for wildlife and livestock using the 2,400-acre area. Crucial winter range for antelope, deer and elk, as well as sage-grouse wintering areas, brood-rearing habitat, and numerous leks exist within the project area.

This project was started in 2009 with a combination of WLCI, Bureau of Land Management (BLM), and private funds. For three years prior to the project proposal submission, the BLM Rawlins Field Office and DuPont conducted field trials to control this plant in a rangeland situation. Previous inventory efforts in the project area have documented the highest densities of of desert alyssum in locations with intensive coalbed methane drilling activity and prescribed burn areas. Treatments with low rates of Chlorsulfuron (1/4 to 1/3 of an ounce) were reportedly very effective on desert alyssum and halogeton while not adversely impacting native forbs. Information gathered from these field trials has been used to develop strategies for the WLCI-funded treatments. Post-treatment monitoring of the 2009 treatments showed a 75-95% reduction in alyssum cover, 15-75% increase in grass cover, and 100% increase in bare ground. These sites were monitored again in 2010 to determine if re-seeding with native grass species was necessary. Learning how to address these types of infestations will benefit areas that have the same situation. This project is the first step in addressing the widespread proliferation of desert alyssum and halogeton, and when completed, treatments are planned to expand to additional areas lower in the watershed. These efforts contribute to landscape-scale strategy development to address the invasive species in widespread areas on a long-term basis and addresses the priority area issue of crucial habitat degradation. Project partners include the BLM, Carbon County Weed and Pest District (CCWP), local landowners/permittees, and several oil and gas companies.

2. Sagebrush Habitat Treatments (JO Ranch)

This project involves mowing and seeding of native forb species in riparian and transitional riparian/upland areas to increase forb and invertebrate diversity. It focuses on improving habitat for a diversity of species, particularly sage-grouse and other BLM sensitive avian species such as the Brewer's sparrow *(Spizella breweri)* and sage thrasher *(Oreoscoptes montanus)*, which rely on riparian habitats for critical brood-rearing requirements in the Sand Hills ACEC. The intended outcome of the project is an enhanced vegetative component in the area, which in turn would provide additional invertebrate food sources for species that utilize the riparian habitat. This area contains sage-grouse core habitat, crucial winter range for mule deer and elk, and year round habitat for pronghorn. The project is also located within a mule deer migration corridor.

Treatment methods include physical manipulation through mowing, imprinting, or just inter-seeding to create an enhanced vegetative mosaic within riparian or transitional riparian areas lacking in vegetative species and structural

diversity. Weed treatments prior to seeding ensure the native species have an advantage over the numerous invasive plants in the 378-acre area. In 2010, ten acres of alyssum were treated with herbicide, and Russian olive was hand cut and treated with herbicide. Additional treatments and monitoring occurred in 2011, along with efforts to target future treatment and seeding areas. Crested wheatgrass treatment and inter-seeding was conducted in 2012 and monitored in 2014. Invasive weed treatments were completed on 20 acres for perennial pepperweed in 2014. Project monitoring is achieved through vegetation transects and photo points. The potential also exists to monitor the level of wildlife use of the site through increases or decreases of wildlife populations in the area. Treatment and monitoring of known infestations will continue, and inventory will be conducted to search out any new infestations.

This project area lies within the Sand Hills/JO Ranch ACEC and conservation actions are consistent with the objectives identified within the Rawlins Resource Management Plan (RMP). The objectives for the ACEC are to: 1) protect the unique vegetation complex, 2) maintain wildlife habitat values, 3) minimize soil erosion, and 4) promote recreation opportunities (Bureau of Land Management, 2008). Currently an interdisciplinary ACEC plan is being developed which will ensure long term management goals established in the Rawlins RMP are met. This project's success will help to achieve the goal set out in the RMP for this unique area in addition to addressing the WLCI priority area issues of invasive species and sagebrush habitat degradation. Project partners include the BLM, WGFD and the Natural Resources Conservation Service (NRCS).

3. Red Rim - Grizzly WHMA Fence Conversions

The primary objective of this project is to facilitate big game movement on the Red Rim – Grizzly Wildlife Habitat Management Area by converting fences that block wildlife migration and cause animal fatalities to meet wildlife-friendly fencing standards. Eliminating obstacles that impede movement of animals between life stage habitats will reduce fragmentation of big game ranges and enhance the overall effectiveness of the Grizzly WHMA. Specific wildlife benefits include 1) reduced potential for significant antelope mortality in a portion of the Baggs herd caused by a severe snowstorm during the fall migration, 2) reduced potential for stress on migrating antelope in this portion of the Baggs herd, thereby alleviating some of the physiological demands for survival on crucial winter range, and 3) facilitation of free movement of antelope, mule deer and elk on their summer home ranges, allowing them to choose and utilize optimum habitat types. This is especially important during drought years for lactating females in the fawn and calf-rearing period. Additional benefit will be realized by sage-grouse with the removal of woven wire fencing.

WLCI has funded this project since 2008, and conversions are planned to continue through the 2019 calendar year. It is planned in phases, where a contractor is hired to remove and reconstruct at least 4 miles of fence annually. Existing woven wire, 6-strand and 5-strand fences in antelope and mule deer migration corridors are being converted to meet WGFD wildlife specifications for spacing including a smooth wire bottom strand. In 2014, planning was completed for 5.5 miles of fence conversion in 2015. WLCI funding was received too late in the 2014 field season to use, but fence conversion sites were reevaluated and BLM/WGFD grazing permittees completed 3 miles of fence conversion or reconstruction. Partners include WGFD, BLM, and permittees. WGFD and permittees are also partners in the Rawlins Fence Conversion project, along with the Little Snake River Conservation District (LSRCD), industry, and the Wyoming Wildlife and Natural Resource Trust (WWNRT). This continuing project has converted fencing on the Grizzly WHMA and in several other locations in the Carbon LPDT area. In addition to addressing the priority area issues of migration corridor maintenance and big game passage, the project contributes to the 38,000-acre WHMA's effectiveness by playing a role in meeting its wildlife enhancement objective.

4. Baggs Deer Crossing (Underpasses and Fencing)

The Baggs Deer Crossing project is a collaborative effort to facilitate wildlife passage under Highway 789 where vehicle/wildlife collisions are high. The multi-year project focuses efforts on a 5-mile stretch of the highway that is a research demonstrated migration corridor critical for providing big game species access to crucial winter habitat. The primary objective of the project is to facilitate movement for mule deer throughout their respective habitat and herd units.

The WLCI has contributed funding for various components of the project since 2008. Two underpasses were constructed between 2009 and 2012. Underpass locations were chosen from data and information garnered from

GPS collaring and highway data. The second underpass was installed closer to Baggs in 2012 to alleviate the problem of migrating herds bypassing the first underpass and fences by migrating through town. Additional activities associated with underpass construction include constructing 10 miles of deer proof fence to funnel migrating deer herds under Highway 789 and the installation of six cattleguards to prevent deer movement through fences at current access points. Facilitating big game movement and tracking their progress is an integral part of the success of the wildlife crossings. WGFD has monitored wildlife use following the construction of the new mule deer underpass structures and will continue for several years. A technician was hired from 2009 to 2010 to monitor and facilitate mule deer migration until the animals adjusted to the new crossings with the creation of snow trails, "herding attempts", and baiting. Capture and marking methods as well as video cameras are being used to monitor mule deer use of the underpasses. From the fall of 2009 to the spring of 2010, an estimated 5,423 deer crossed through the first constructed underpass. Deer/vehicle collisions were reduced to less than 50 occurences from hundreds prior to implementation of the underpass and related fencing. Forty-six deer (19 does, 11 fawns, and 16 bucks) within the herd were captured and marked in 2012. Over 15,000 deer crossings have been recorded to date.

The Baggs deer crossing project addresses the geographic priority area's issues of migration corridor maintenance and big game passage, specifically the barrier that Highway 789 creates for migrating deer to access additional winter range in the Powder Rim area. These crossings provide habitat connectivity by allowing deer, elk, and other wildlife species to safely cross Highway 789 north of the town of Baggs, reducing the incidences of vehicle and wildlife collisions. In addition to the benefit of reduced wildlife mortality, motorists benefit with enhanced safety and reduced vehicle damage. Partners include the Wyoming Department of Transportation (WYDOT), WLCI, WGFD, LSRCD, BLM, and the WWNRT.

5. Juniper Woodland Treatments

The primary objective of this project is to mechanically remove juniper on 500-600 acres to maintain or enhance mountain shrub and sagebrush habitat in mule deer crucial winter range. Mountain shrub and sagebrush communities are reportedly declining in cover and production due to encroachment by juniper and heavy browsing in mule deer and antelope crucial winter range. There have been very few treatments to remove juniper over the last fifty years.

In 2011, WLCI began funding this project which utilizes both a bobcat and a fuels crew with chainsaws to remove decadent juniper stands and restore native grasses, forb and shrub species. Cut trees and boughs are left to protect new or released shrubs from browsing, and placed in draws to reduce water runoff and soil erosion. This project continues ongoing juniper removal efforts, which treated approximately 100 acres between 2002 and 2010 in the Baggs area by the BLM and private landowners. Fifty acres of Utah juniper *(Juniperus osteosperma)* were thinned using chainsaw in 2011, nearly completing the 130-acre total treatment in the Dad Juniper area 25 miles north of Baggs. Since 2011, the project focus has changed to address encroachment into sagebrush shrublands in the Baggs vicinity. Monitoring shows shrub response is slow, however, herbaceous plants have increased and bare ground has reduced. NEPA and archaeological requirements were completed in 2012. Juniper treatments are planned to continue in the Baggs and Powder Rim area. Partners include BLM, WWNRT, and LSRCD.

6. Baggs Area Fence Conversion

This project is part of a landscape-scale effort to convert existing fences within the Rawlins Field Office to BLM wildlife friendly standards to reduce injury, stress, and mortality to big game and other wildlife species.

Approximately 10 miles of fencing in mule deer crucial winter range west of the town of Baggs were converted from 6-wire barbed fences and mesh with 2 barbed wire fences to BLM standard 4-wire fences. This completed the primary conversion of north-south fences in the Powder Rim allotment. Materials were paid with funding from WWNRT, and labor was provided by the Wyoming Conservation Corps. WLCI funded the project in 2011 and conversions were completed in the spring of 2012. Monitoring consists of before and after photos and long-term fence maintenance by permittees.

This project addresses the geographic priority area's issue of big game passage by addressing impediments to movement within mule deer crucial winter range. Fence conversions provide habitat connectivity for big game

including mule deer that migrate from the Sierra Madre Mountains and depend on this crucial winter range in the Powder Rim allotment. In addition to reduced stress, energy loss, injury, and mortality, intended project outcomes include greater animal survival in winter and perhaps more animal movement that would reduce localized severe browsing on mountain shrub and big sagebrush plant communities.

Additional Conservation Actions Conducted by WLCI Partners –

- Invasive plant control efforts have occurred throughout the priority area. In addition to the Desert Alyssum Inventory and Control project described above, BLM efforts include cheatgrass, black henbane and Canada thistle treatments within the Grizzly WHMA, and tamarisk treatment and/or inventory on Muddy Creek and the Little Snake River.
- See the narratives for Medicine Bow & Fringe Aspen, Little Snake River/Sand Creek/Savery Creek, and Upper Muddy Creek Watershed/Grizzly SMA geographic priority areas for details on additional projects as they address issues within those priority areas.

Timeframe: 20 years.

Relationship to Existing Plans and Other Actions

- WGFD Strategic Habitat Plan (Wyoming Game and Fish Department, 2009)
- Habitat and Access Branch five year plan for the Grizzly Wildlife Habitat Management Area
- Managed Land Summary five year plan for the Grizzly Wildlife Habitat Management Area
- Rawlins BLM Resource Management Plan (Bureau of Land Management, 2008)

Ferris & Seminoe Mountains Geographic Priority Area

Environmental Setting

Ferris & Seminoe Mountains Geographic Priority Area (see figure 3-3) encompasses 99,154 acres of federal, state, and private land in Carbon County. Defined by the forest perimeter of the mountains, it is comprised of aspen, conifer, riparian, and mixed mountain shrub habitats. The Ferris Mountain Wilderness Study Area (WSA) and the Morgan Creek Wildlife Habitat Management Area (WHMA) exist within its boundaries and WGFD has identified it as a terrestrial enhancement habitat priority in its Strategic Habitat Plan (Wyoming Game and Fish Department, 2009). The area supports numerous Species of Greatest Conservation Need (SGCN) and big game such as mule deer, elk, and bighorn sheep *(Ovis canadensis)*. WLCI partners have identified Ferris and Seminoe Mountains as priorities for addressing aspen community loss due to lack of fire and conifer encroachment, but a large wildfire occurred on Ferris Mountain in 2012. Plans for prescribed burning have been adjusted to incorporate effects of the wildfire on forests within the area.

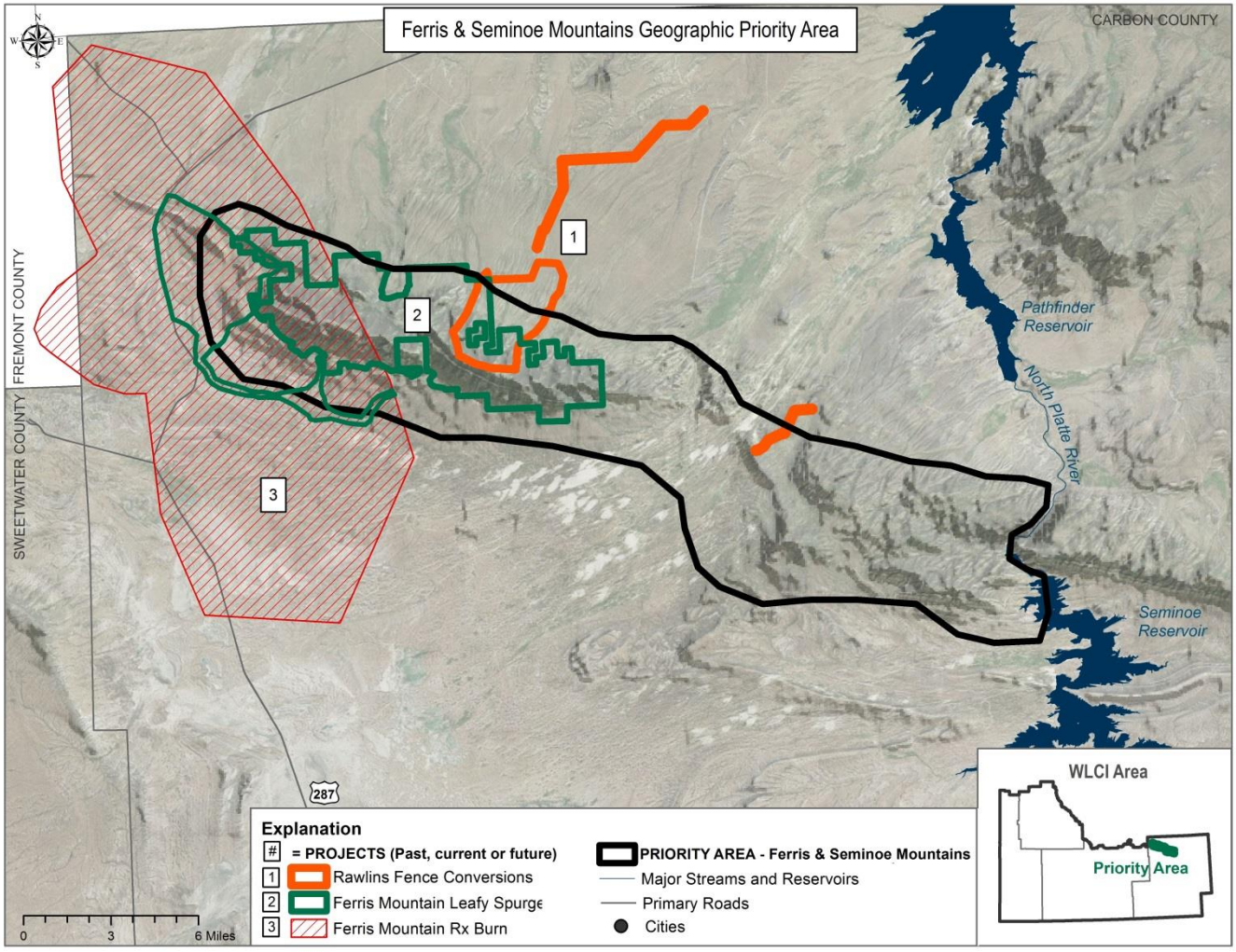

Figure 3-3. Ferris & Seminoe Mountains Geographic Priority Area and projects

Issues:

- **Invasive plant species:** Leafy spurge *(Euphorbia esula)* and cheatgrass *(Bromus tectorum)* are two prevalent invasive species that partners have identified as issues within the Ferris & Seminoe Mountains Geographic Priority Area. In addition to leafy sprurge, whitetop *(Lepidium draba)*, Russian knapweed *(Acroptilon repens)* and Canada thistle have been documented within the Ferris Mountain WSA.
- **Migration corridor maintenance and big game passage:** Non-wildlife friendly fencing impedes big game passage in the geographic priority area, causing wildlife stress, injury and mortality. Also, bighorn sheep migration routes have been lost due to conifer encroachment.
- **Aspen decline/conifer encroachment:** Lack of fire has allowed conifer encroachment into aspen stands and riparian areas, resulting in a decline in aspen on Ferris and Seminoe Mountains. Forage and cover once provided by aspen to a wide variety of wildlife species is therefore declining consequentially.
- **Tree disease and decadence:** Decadence and disease has been reported as common in the Ferris Mountain prescribed burn project area. Mistletoe, blister rust, bleeding rust, and mountain pine beetle infestations have been identified as issues.

Conservation Actions and Intended Outcomes

1. **Rawlins Fence Conversions**

The Rawlins Fence Conversion project is a continuing landscape scale effort to convert existing fences within the Rawlins Field Office to BLM wildlife friendly standards to reduce injury, stress, and mortality to big game and other wildlife species. Approximately 2,000 miles of fencing within the Rawlins Field Office were identified as not meeting wildlife friendly standards in the 2009 project proposal. The goal is to convert 8 to 15 miles of fence per year to BLM standards. Strategies include supplying materials to ranchers who would provide or pay for the labor to replace old fences, utilizing Wyoming Conservation Corps or volunteers to provide the labor for conversions, and issuing contracts to complete some fence conversions.

In 2012, Wyoming Conservation Corp crew converted 1.1 miles of non-standard BLM fences on the north slope of Ferris Mountain (Pole Canyon allotment) to a wood post/rail top with two strands of barbed wire, and a third smooth bottom wire. In 2013, the crew completed 3.5 miles of fence conversion, including 2 miles along the Buzzard/Pole Canyon allotment boundary, 0.25 mile of wood post and rail-top construction, and 1.5 miles of pasture fence conversion. In 2014, contractors modified 2.9 miles of fence in three locations on the east and south sides of Ferris Mountain, which completes all but one fence coming off of Ferris Mountain. The Montana Conservation Corps converted ¼ mile of mesh sheep fencing, and constructed a three-acre exclosure around Wood Creek Spring. Both projects are just east of Ferris Mountain in the Junk Creek allotment. The focus for the next several years will expand to areas north and east of Rawlins where four large allotments have sheep fencing and two of them are under new management more willing to work as partners with BLM in this effort. Eight miles of fence conversion are planned for 2015 between the Rawlins and Lander Field Offices, north and west of Bairoil. Other entities in this area are also working to convert fences to improve access for migrating wildlife. This WLCI project is a continuation of the Muddy Creek and Wyoming Conservation Corps fencing conversion project, and it complements fence conversion efforts in other areas throughout the Rawlins Field Office including the Grizzly WHMA, Red Rim WHMA, and the Baggs area (Powder Rim Allotment).

The project addresses the geographic priority area's issues of migration corridor maintenance and big game passage by addressing impediments to migration and general movement to big game species. In addition to reduced stress, energy loss, injury and mortality, intended outcomes include greater animal survival in winter and perhaps more animal movement that would reduce localized severe browsing on mountain shrub and big sagebrush plant communities. Project partners include BLM, Wyoming Conservation Corps, WGFD, permittees, LSRCD, industry, and WWNRT. Monitoring consists of before and after photos and long-term fence maintenance by permittees.

2. Ferris Mountain Leafy Spurge and Russian Knapweed Treatments

This ongoing project has consisted of treating the Ferris Mountain WSA and adjacent hogback ridges for invasive weeds since 2007, with a focus on leafy spurge and Russian knapweed. The primary objective of the project is to reduce the expansion of or eliminate known weed patches, find and eliminate new patches, and stop seed production of existing patches. . The main goal is to restrict weed infestations to the currently affected landscape, preventing the weeds from expanding onto nearby ranches and into adjacent mountainous areas. A second goal is to remove or contain other noxious weeds where possible to prevent further degradation of habitat.
Inventory, monitoring, and integrated pest management are used to find, treat, and monitor leafy spurge and other weeds including Russian knapweed, whitetop and halogeton. Both aerial and ground herbicide applications are used to control weeds in the extremely rugged project area. Monitoring in 2005 showed actual infestation into the WSA for the first time, along with an increase in acreage infested along the fringes of the wildlife-rich WSA. Invasions are also occurring on adjacent hogback ridges. At least 400 acres of treatments have been conducted annually since 2008, and monitoring and inventory of additional areas continues. Monitoring consists of GPS and photo documentation of patches, and patch extent, density, and condition is recorded and compared to sites from the previous year. Ocular monitoring of 2008 treatments showed reductions of 10 to 80% in 2009. Continued funding has helped in the identification of new patches and removal of some from the area. Aerial treatments were not required in 2013, as past treatments have thinned infestations. As long as on-the-ground maintenance activities continue in this area, aerial treatments are not expected to be required in the future.

This project addresses the priority area's invasive species issue and is expected to improve wildlife habitat quality and livestock grazing forage. The area provides seasonal and some winter habitat for elk and deer, as well as the few remaining bighorn sheep in this unique region. It also supports numerous Species of Greatest Conservation

Need. The majority of the area contains sage-grouse habitat, including core area in the northern end. This project therefore provides maintenance of the quality of crucial or important habitats. It also includes private land owner collaboration to connect weed treatments with those being conducted on agricultural lands. Partners include the BLM, Carbon County, and grazing permittees.

3. Ferris Mountain Prescribed Burn

This project was proposed in 2012 to conduct fall prescribed burns on Ferris Mountain in order to remove dead, decadent and encroaching conifers from aspen, riparian and mountain shrub habitats. Long-term wildfire suppression promoted conifer encroachment into these habitats to the extent that many of these communities were reportedly non-functional. Decadence and disease was commonly observed in terms of mistletoe, blister rust, and bleeding rust, and pine beetles infestations have caused mortality in many of the older pine trees. The original objective was to treat 40-70% of the 42,576 acre treatment area over 10-20 years. However, a summer wildfire burned nearly 9,000 acres, including a portion scheduled to be treated as well as additional un-planned acreage.

Approximately 1,650 acres were treated with an aerial application of Plateau herbicide in order to reduce emergence and spread of cheatgrass following the wildfire. No WLCI funds were spent on this project in 2012. The area will be re-evaluated prior to any prescribed fires and the burned area will be monitored. The fire program will assist with funding for reseeding, monitoring, and fencing. Additional herbicide applications are planned in September 2014. Intended outcomes of the project include restoration of aspen, riparian, sagebrush and mountain shrub communities that were being encroached by conifers. Downward trends in plant diversity, production, age-class and cover within these communities as a result of conifer expansion are expected to reverse as a result of the project. The project is expected to allow for future reintroduction of bighorn sheep to the area, help achieve population objectives for mule deer, improve streamflows and trout fisheries on and away from the mountain, and improve habitat diversity, benefiting all wildlife species.

Additional Conservation Actions Conducted by WLCI Partners –

- The BLM High Desert District plans to conduct several prescribed fires in 2015 contingent upon fuel moisture and weather meeting optimal burn conditions. The Cherry Creek burn includes approximately 250 acres of slash fuels left from mechanical treatments of encroaching conifers within aspen and willow riparian areas on the northwest slope of Ferris Mountain. The treatment is designed to encourage aspen regeneration and other riparian vegetation within the target drainages.

Timeframe: At least 20 years.

Relationship to Existing Plans and Other Actions –

- BLM Rawlins Resource Management Plan (Bureau of Land Management, 2008)
- WGFD Strategic Habitat Plan (Wyoming Game and Fish Department, 2009)

Hay Reservoir Geographic Priority Area

Environmental Setting

Hay Reservoir Geographic Priority Area (see figure 3-4) encompasses 1,254 acres of federal, state and private land within the Great Divide Basin. While located in northeast Sweetwater County, it falls within the BLM Rawlins Field Office boundary. Carbon LPDT members have identified this area as a conservation priority for noxious weed control and invasive species eradication. Habitat supports big game including pronghorn *(Antilocapra americana),* mule deer *(Odocoileus hemionus)* and elk *(Cervus canadensis),* as well as brood-rearing sage-grouse *(Centrocercus urophasianus)* and numerous other sensitive wildlife and plant populations. Hay Reservoir and the surrounding sagebrush communities are located within the Cyclone Rim grazing allotment, and support livestock in addition to native wildlife species.

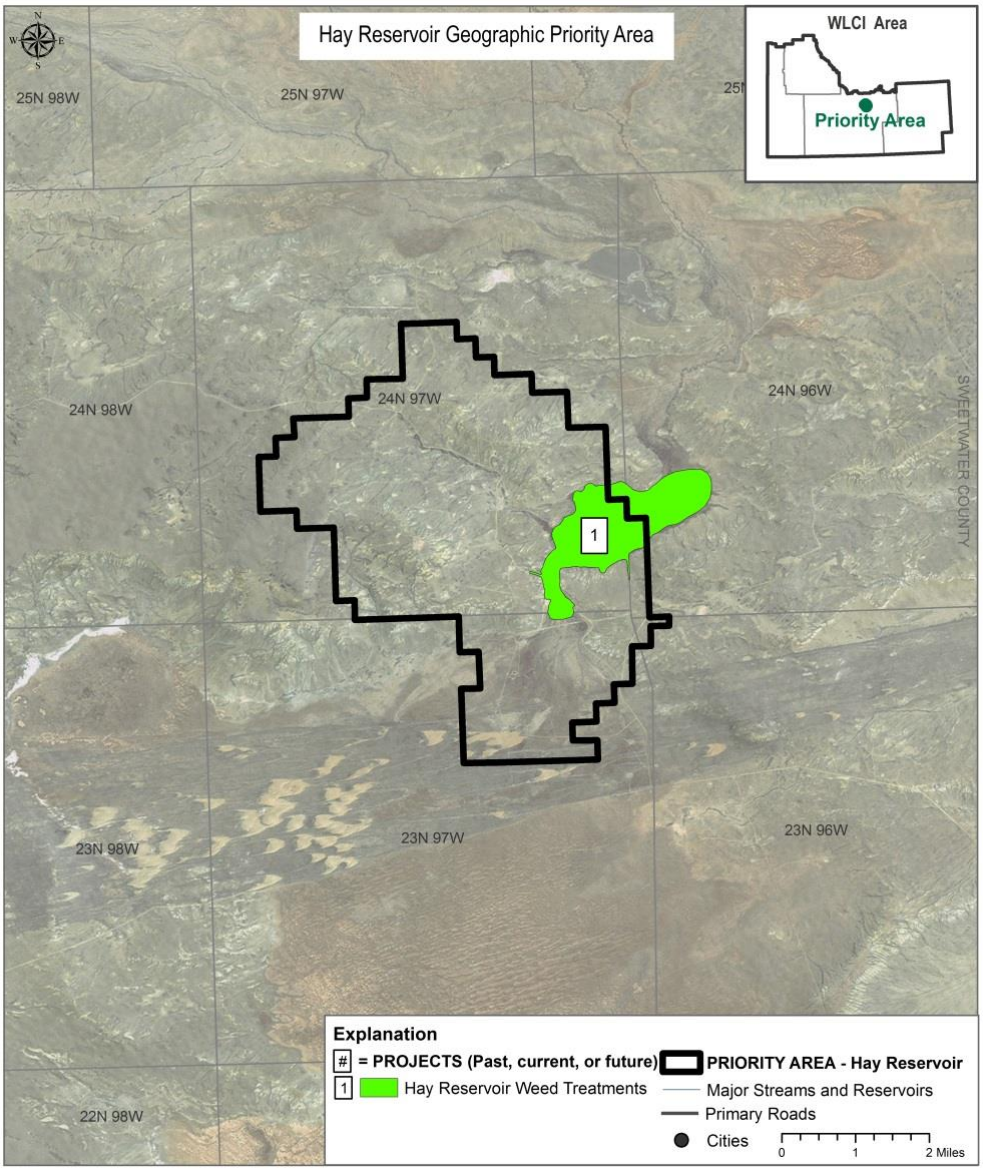

Figure 3-4. Hay Reservoir Geographic Priority Area and projects

Issues:

- **Invasive plant species:**
  Russian knapweed *(Acroptilon repens)* and whitetop *(Lepidium draba)* are two prevalent noxious weed species that have expanded within the Hay Reservoir Geographic Priority Area. Additional invasive species have been documented including saltcedar *(Tamarix ramosissima)*, henbane *(Hyoscyamus niger)*, and Swainson pea *(Sphaerophysa salsula).* The area has failed to meet Standards for Healthy Rangelands due to the invasive plant infestation.

Conservation Actions and Intended Outcomes

1. Hay Reservoir Weed Treatments

The primary objective of the Hay Reservoir project is to restore native plant communities by controlling Russian knapweed and whitetop expansion, as well as other invasive species encountered (such as saltcedar, henbane, and Swainson pea) in the geographic priority area. Conservation actions include inventory, treatment and monitoring of approximately 1,200 acres with ground applications of herbicide. The project is designed to help achieve Standards for Healthy Rangeland and to maintain or restore and protect sagebrush communities that support livestock and wildlife within the project area. Halting seed production annually prevents animals from spreading viable seed. Treatments are expected to directly reduce water wastage, erosion, and sedimentation into Hay Reservoir, benefiting Red Creek and the species that rely on these aquatic resources. The area provides habitat for sage-grouse and seasonal and winter habitat for elk, deer, and pronghorn.

Since 2008, over 675 acres of invasive plants have been treated on both public and private lands within the geographic priority area. Saltcedar plants were successfully removed from the project area in 2008. Ocular monitoring of 2008 treatments showed a 70 to 80 percent kill rate and the identification of a new location of a sensitive species, persistent sepal yellowcress (*Rorippa calycina)*. Continued monitoring of previously treated areas has shown decreased weed density and increased cover of beneficial grass species. Currently, monitoring consists of photo points taken of patches, and documentation of patch extent, density, and condition. Chemical treatments (75 acres), inventory, and monitoring (450 acres) continued in 2014, and weeds were reportedly difficult to find as a result of the success of past treatments. Treatments were also completed by the ranch owners in 2014. Provided infestation maintenance continues, this project should not require any more large scale treatments and should show a continued declining trend in plant density.

The BLM project lead works directly with Sweetwater County Weed and Pest District (SCWPD) and the private landowner to treat weeds on BLM lands in conjunction with treatments on adjacent private and state lands. SCWPD has donated herbicide and a truck mounted sprayer and operator to treat roadsides in the project area. The landowner has paid for the cost of labor to treat their private land and state lands, and the BLM has paid for labor to treat federal land. The project is estimated to take approximately four more years to complete, and WLCI funding is planned to provide labor and cover herbicide costs to treat the area through the project's duration. Continuation of this work through 2017 is necessary to ensure reinvasions do not occur, with annual monitoring and maintenance applications of past treatments conducted as needed. The private landowner is also planning on continuing treatments to expand upon the good results from past treatments. Long-term management of this area will help to ensure weeds are not re-introduced and that areas under long-term control are not spreading by limiting the seed production of Russian knapweed, whitetop, and other invasive plant species. This project protects and maintains important or crucial habitats for mule deer, elk, pronghorn, and sage-grouse by unremittingly addressing the priority area's invasive species issue.

Timeframe: 15 to 20 years.

Relationship to Existing Plans and Other Actions –

- BLM Rawlins Resource Management Plan (Bureau of Land Management, 2008)
- WGFD Strategic Habitat Plan (Wyoming Game and Fish Department, 2009)

Little Snake River/ Sand Creek/ Savery Creek Geographic Priority Area

Environmental Setting

The Little Snake River/Sand Creek/ Savery Creek Geographic Priority Area (see figure 3-5) includes all portions of the Little Snake River corridor that fall within Wyoming's borders as well as three of its tributaries. It is primarily located in southern Carbon County, and the Sand Creek riparian corridor extends northwest into Sweetwater County. The Little Snake River is a tributary to the Yampa River that meanders between southern Wyoming and

northern Colorado. The river corridor provides important cottonwood and willow riparian habitat diversity used by numerous terrestrial and aquatic wildlife species, and the meandering nature of the channel has created many large, deep holes that provide fish cover. It provides habitat for sensitive fish species including the bluehead sucker, flannelmouth sucker, roundtail chub, and it may provide seasonal habitat for the Colorado pikeminnow *(Ptychocheilus lucius)* (Wyoming Game and Fish Department, 2009). The priority area includes Dirtyman Fork, a tributary to Savery Creek that provides habitat for a conservation population of genetically pure Colorado River cutthroat trout. High Savery Reservoir, also located within the priority area, supports the brood source for Colorado River cutthroat trout (CRCT) eggs that are used for stocking of all cutthroat restoration waters in the Little Snake River Watershed. The Little Snake River has been and continues to be a focus of extensive river restoration efforts by multiple WLCI partners and private landowners. The geographic priority area overlaps portions of two geographic priority areas: 1) Baggs Big Game/Terrestrial Enhancement, and 2) Medicine Bow & Fringe Aspen.

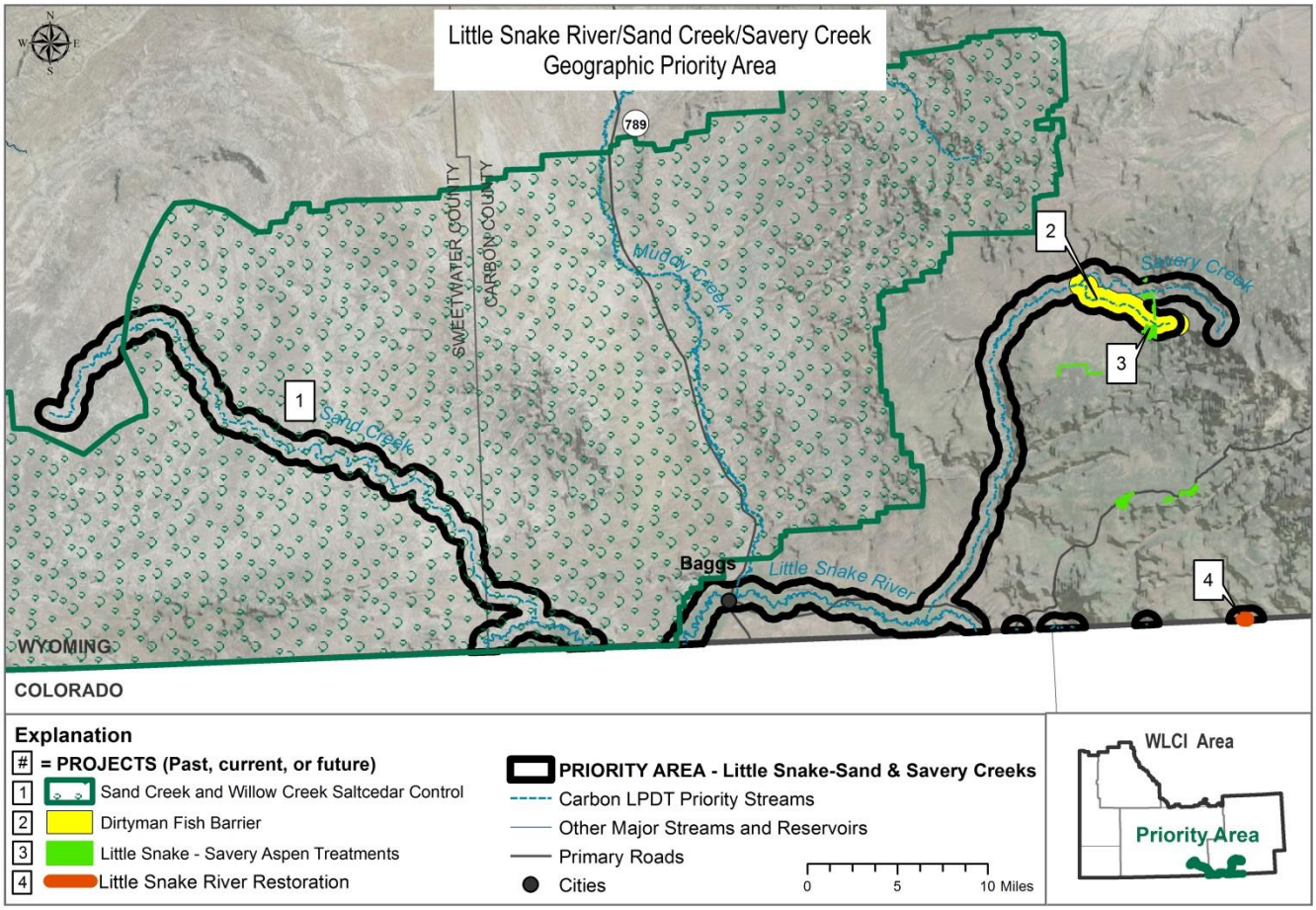

Figure 3-5. Little Snake/Sand Creek/ Savery Creek Geographic Priority Area and projects

Issues:

- **Invasive plant species:** Saltcedar has invaded riparian zones on Sand Creek and Willow Creek, two tributaries of the Little Snake River. If the invasion is not addressed, potential exists for expansion downstream to the Little Snake River and to other connected water bodies.
- **Sensitive native fish populations:** The Little Snake River and its tributaries provide habitat for sensitive native fish species whose populations have declined range-wide. The Little Snake River provides habitat for the bluehead sucker, flannelmouth sucker, roundtail chub, and it may provide seasonal habitat for the Colorado pikeminnow (Wyoming Game and Fish Department, 2009). Dirtyman Fork provides habitat for a conservation

population of genetically pure Colorado River cutthroat trout, and High Savery Reservoir supports the brood source for CRCT eggs that are used for stocking of all cutthroat restoration waters in the Little Snake River Watershed. Habitat degradation and hybridization with non-native species has reportedly contributed to the decline of each of these species, and habitat protection is warranted (Wyoming Game and Fish Department, 2009), (Senecal, Gelwicks, Cavalli, & Keith, 2010), (Young, Schmal, Kohley, & Leonard, 1996).

- **Fish barriers:** Maintenance of a fish barrier on Dirtyman Fork is essential to the protection of the native CRCT population found in the headwaters of this stream (Wyoming Game and Fish Department, 2009). Irrigation diversion structures on the Little Snake River are barriers to fish passage and fragment native fish habitat (NRCS, 2013).
- **Aquatic and riparian habitat degradation:** An assessment of channel stability of the Little Snake River indicates high lateral instability with considerable aggradation and channel enlargement potential. Consequently, sediment supply within the reach assessed near Baggs is high (Little Snake River Conservation District, 2011). Existing irrigation diversion structures within the reach are contributing to channel instability by reducing sediment transport capacity and enlarging the channel. Additionally, the diversion structures are currently creating fish barriers and fragmenting native fish habitat. Some reaches of the river have been channelized and straightened in an effort to protect private lands. WGFD has reported reduced watershed function as a result of declining aspen stands, and the need for healthy aspen stands and beaver to secure the long-term viability of a fragile CRCT population in Dirtyman Fork. Flows in the small perennial stream are adversely affected by drought cycles that began in the late 1980's (Wyoming Game and Fish Department, 2009).
- This area overlaps two geographic priority areas, each with its own set of issues. See the narratives for Baggs Big Game Corridor/Terrestrial Enhancement and Medicine Bow & Fringe Aspen geographic priority areas for details on additional issues.

Conservation Actions and Intended Outcomes

1. Sand Creek and Willow Creek Saltcedar Control

The Sand Creek and Willow Creek Saltcedar Control project entails treating approximately 65 miles of stream bottom and all infested reservoirs in the Wyoming BLM portion of the Colorado River Watershed for saltcedar invasion with aerial and ground applications of herbicide. The objective of the project is to eradicate saltcedar from Sand Creek, Willow Creek, Muddy Creek, their tributaries, and approximately a 30-mile buffer zone to the east of Sand and Willow Creeks. This project will directly reduce water wastage, erosion, sedimentation, and salt loading into the Little Snake River, a tributary to the Colorado River.

This ongoing project began in 2008 with 300 acres of tamarisk treatments. In 2009, 300 acres were treated, two new sites were found and treated, inventory of the Little Snake River was initiated, and monitoring of 2008 treatments reported 95-100% kill rates. In 2010, 500 acres were treated and inventory of the Little Snake River continued. In 2011, 500 acres were treated, 100 acres inventoried, and monitoring of 50 acres reported a 99% reduction of saltcedar. In 2012, 75 acres were treated, 200 acres were monitored, and 20,000 acres were inventoried. Inventories from 2012 found that approximately 30% of reservoirs in the area were infested with saltcedar. Re-sprouts within previous treatment areas were identified for re-treatment. In 2013, 250 acres were treated on Sand Creek, the entire length of Willow Creek, and 63 reservoirs in the vicinity. Additionally, 500 acres were inventoried and monitoring of treatments reported a 90% kill rate. In 2014, 24 miles of Muddy Creek stream bottom and flood plains were monitored and re-treated as necessary, along with 170 reservoirs/sites inventoried. Only 10 reservoirs were found to be infested from those inventoried in 2014. Plans include monitoring treated areas every three years, which will allow for the detection and treatment of new plants and re-sprouts before they mature enough to set seed.

This project benefits two stream systems, native vegetation, and the wildlife that use the water in these drainages and downstream. This project will free up water into the Colorado River system for downstream threatened and endangered species, and help achieve Standards for Healthy Rangelands. The project area contains headwater streams that influence sensitive fish species downstream, potential threatened Western yellow-billed cuckoo

habitat, and it supports deer, elk, antelope, and many other wildlife species. Partners include the BLM, Sweetwater County Weed and Pest, industry, and grazing permittees.

2. Dirtyman Fish Barrier

The Dirtyman Fish Barrier project replaced a degraded barrier in 2012 to prevent the loss of a genetically pure CRCT population. Declines in populations of CRCT have limited current population distributions to isolated headwater streams and lakes. Dirtyman Fork is one example of an isolated headwater stream in the Colorado River Basin. Previous conservation efforts on Dirtyman Fork include the removal of non-native fish species, construction of a fish barrier, and re-introduction of genetically pure CRCT. However, the construction of the barrier occurred over 20 years ago and needed to be replaced before the integrity of the barrier was lost. The project has met its primary objective to maintain a genetically pure population of CRCT by preventing non-native fish from invading upstream of the old barrier. The BLM collaborated with WGFD and private landowners for project implementation.

WLCI funding supported the hiring of a contractor to remove and replace the degrading fish barrier on Dirtyman Fork. The project addresses the issues of fish barriers and sensitive native fish species conservation in the Little Snake River/Savery Creek/ Sand Creek Geographic Priority Area. It prevents the invasion of non-native fish species into the CRCT habitat, which partners have identified as one of the primary threats to CRCT populations. Implementation of this project contributes to interagency efforts to meet objective 2 of the Conservation agreement for Colorado River cutthroat trout in the States of Colorado, Utah and Wyoming, to "secure and enhance conservation populations" (CRCT Conservation Team, 2006). Protection of headwater populations is one of the first steps in restoring populations of CRCT to other streams within their native range. This project plays a role in larger CRCT restoration efforts for the Little Snake River Watershed and for the Colorado River Basin.

3. Little Snake – Savery Aspen Treatments (Aspen Conservation Joint Venture)

Aspen stands have been treated within and near the riparian corridors of Savery Creek and Dirtyman Fork as part of a larger aspen restoration effort within the Little Snake River Watershed. Treatments address issues of watershed function and productivity as they relate to conserving sensitive native fish populations in this portion of the priority area. WGDF's Strategic Habitat Plan reports that healthy aspen stands and beaver are required to secure the long-term viability of the fragile Colorado River cutthroat trout population found in the headwaters of Dirtyman Fork (Wyoming Game and Fish Department, 2009). Please see the Medicine Bow & Fringe Aspen Geographic Priority Area narrative (Conservation Actions and Intended Outcomes section) below for project details.

4. Little Snake River Restoration

The objective of this completed project was to reduce stream bank erosion and restore aquatic habitat on the Little Snake River. The project involved the construction of approximately 1 mile of 3-strand barbed-wire fence and improved grazing management along a stretch of the river on U.S. Forest Service (USFS) land. The fence was built to meet forest plan standards that allow wildlife movement.

In 2009, the fence was built by USFS personnel and willows were planted to promote rehabilitation of the affected stream bank. The willow planting was done in cooperation between the USFS and the Little Snake River Conservation District, who brought local high school students to help with the planting project. The river and riparian area were monitored in 2010 and results were used to determine if additional work was needed to improve aquatic habitat. Photo points are the primary monitoring method for the project.

The Little Snake River Restoration project addresses the Little Snake River/Sand Creek/Savery Creek Geographic Priority Area's issues of aquatic and riparian habitat degradation, specifically channel instability. Species that utilize the Little Snake River's aquatic and riparian habitats are expected to benefit from reduced stream bank erosion and aquatic habitat restoration. Improved aquatic habitat may provide benefits to the sensitive native fish species inhabiting the Little Snake River. The project location is approximately 3 miles below the Three Forks Ranch, and complements river restoration efforts on the nearby private reaches of the river and its tributaries.

Additional Conservation Actions Conducted by WLCI Partners

- The NRCS is leading a project to restore approximately six channel-miles of the Little Snake River located primarily upstream of the town of Baggs, WY to improve aquatic habitat and restore the channel to a properly functioning condition. The primary objectives of this project are to re-establish the natural channel geometry to a Rosgen classification C-4 channel (low gradient, meandering system with point bars, pools/riffles and a well-developed floodplain), remove or modify irrigation diversions to provide for fish passage requirements, and enhance aquatic habitat (NRCS, 2013).
- In 2000, an extensive river restoration plan for approximately 14.4 miles of the Little Snake River and its tributaries was implemented by Wildland Hydrology of Pagosa Springs, Colorado on Three Fork Ranch. The privately funded project consisted of placing 2,000 structures into the river, narrowing and deepening river/stream channels, planting thousands of willows to stabilize stream banks, and the incorporation of a grazing management plan into restoration efforts.

Timeframe: At least 5 years.

Relationship to Existing Plans and Strategies

- BLM Rawlins Resource Management Plan (Bureau of Land Management, 2008)
- Conservation agreement for Colorado River cutthroat trout in the States of Colorado, Utah and Wyoming (CRCT Conservation Team, 2006)
- Medicine Bow National Forest Plan (U. S. Forest Service, 1985)
- Short-term Plan for the Three Species on the Green River Drainage of Wyoming (Senecal, Gelwicks, Cavalli, & Keith, 2010)
- WGFD Strategic Habitat Plan (Wyoming Game and Fish Department, 2009)

Medicine Bow & Fringe Aspen Geographic Priority Area

Environmental Setting

The Medicine Bow & Fringe Aspen Geographic Priority Area (see figure 3-6) encompasses 395,348 acres of USFS, BLM, state and private land in southern Carbon County west of the Continental Divide. It includes large contiguous aspen stands in western portions of the Sierra Madre Mountains in the Medicine Bow National Forest, as well as smaller, more isolated aspen fringe stands stretching northwest of the Forest Service boundary. The area supports a wide variety of fish, wildlife, and livestock species including various big game species and Species of Greatest Conservation Need (including the only Columbian sharp-tailed grouse population in Wyoming, greater sage-grouse, and genetically pure Colorado River cutthroat trout). The area contains summer and seasonal habitat as well as migration routes for elk, mule deer and pronghorn, and a major parturition area for elk. There are approximately 35,000 - 40,000 acres occupied by aspen in the Little Snake Watershed in the Sierra Madre Mountains and the associated foothills, however partners have reported aspen decline in acreage and condition. Numerous partners have identified this area as a priority for aspen restoration and conservation including members of the Aspen Conservation Joint Venture Working Group. It overlaps portions of three geographic priority areas: 1) Baggs Big Game/Terrestrial Enhancement, 2) Little Snake River/Sand Creek/Savery Creek, and 3) Upper Muddy Creek Watershed/Grizzly Special Management Area.

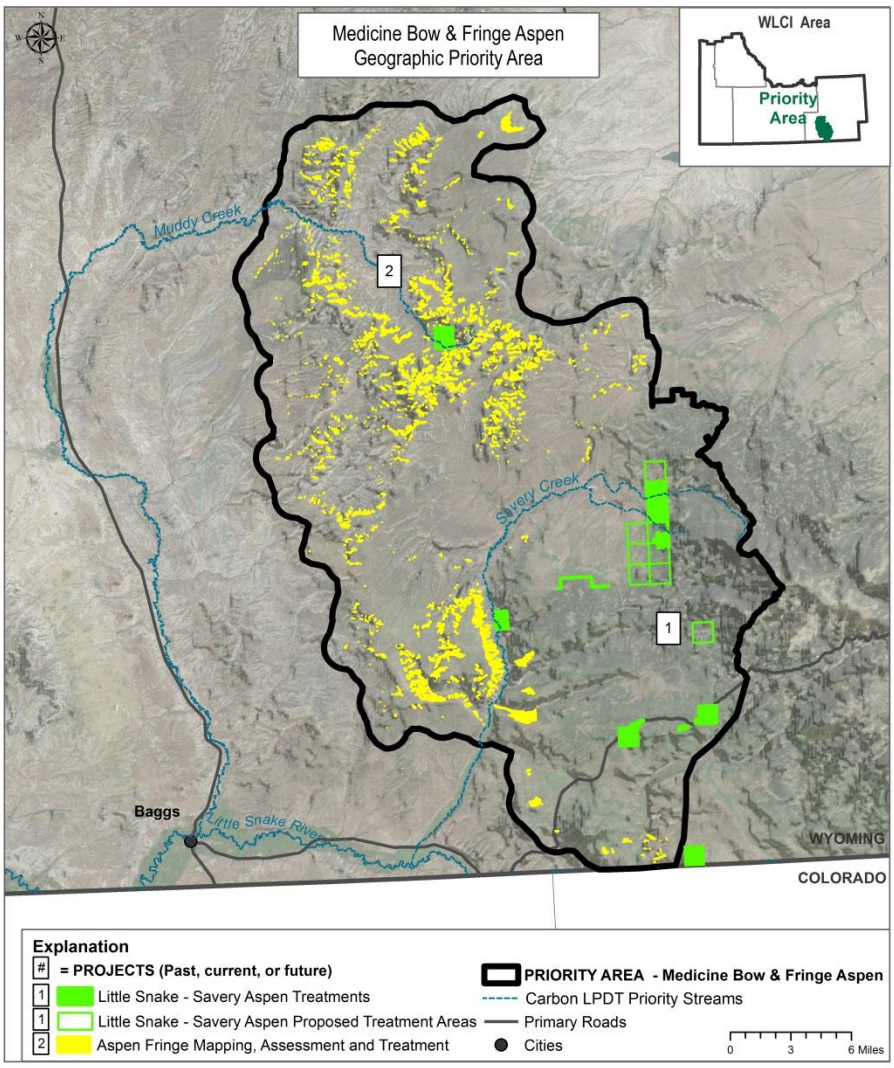

Figure 3-6. Medicine Bow & Fringe Aspen Geographic Priority Area and projects

Issues

- **Aspen community health/conifer encroachment:** Conifer encroachment and lack of fire are two reported causes of declines in the number of acres, condition, and age class of aspen. Lack of wildfires and historic fire suppression has allowed conifers to compete for resources with aspen, and understory herbaceous vegetation is reduced because of increases in canopy cover (Dillon, Knight, & Meyer, 2003). Studies conducted in the Medicine Bow National Forest report aspen stands as older than typical of past stand ages, and increasing amounts of fir have invaded stands (Cerovski, Gorges, Byer, Duffy, & Felley, 2001). Approximately 41,000 acres (49%) of aspen within the Medicine Bow National Forest meet or exceed old growth age minimums (D-47 MBNF Plan). Overbrowsing by elk has also been identified as a factor negatively affecting aspen health. Aerial photographs from 1938 compared to current aspen stands indicate a 50% decline of aspen with little or no aspen found along riparian areas on BLM administered lands within the Little Snake River Basin.
- **Invasive plant species:** Carbon County Weed and Pest District has identified leafy spurge and oxeye daisy (*Leucanthemum vulgare)* invasion as issues within the priority area. The USFS has identified numerous invasive species within sharp-tailed grouse habitat including Canada thistle *(Cirsium arvense)*, musk thistle *(Carduus nutans)*, oxeye daisy, houndstongue (*Cynoglossum officinale)*, and yellow toadflax *(Linaria vulgaris)*.

- This area overlaps three geographic priority areas, each with its own set of issues. See the narratives for Baggs Big Game Corridor/Terrestrial Enhancement, Little Snake River/Sand Creek/Savery Creek, and Upper Muddy Creek Watershed/Grizzly SMA geographic priority areas for details on additional issues.

Conservation Actions and Intended Outcomes

1. Little Snake – Savery Aspen Treatments (Aspen Conservation Joint Venture)

The primary objective of this project is to enhance, maintain, and restore aspen communities in the foothill and montane habitats of the Little Snake River Watershed using all available tools and best management practices. The majority (greater than 80%) of land occupied by aspen in the Sierra Madres is found in the Little Snake River Watershed, and the Sierra Madres have the greatest number of acres of aspen of any mountain range in Wyoming. Between 2008 and 2018, 12,000 acres are planned for treatment to restore age class diversity, acres occupied, and vigor of aspen communities within the geographic priority area.

Aspen community restoration as well as hazardous fuels reduction is achieved through mechanical treatment, conifer removal, prescribed fire, and transplanting aspen in key riparian areas. Treatments are conducted on a landscape scale throughout state, private, USFS, and BLM lands. Since the project's inception, over 2,000 acres of aspen habitat have been treated mechanically and approximately 400 acres of prescribed burns have been conducted. Accomplishments include approximately 400 acres of prescribed fire treatment and a mile of stream improvement with woody riparian plantings in 2008, 514 treatment acres in 2009, 61 treatment acres and 400 acres of habitat restoration in 2010, 600 treatment acres (including three prescribed burns and mechanical treatments in beetle kill areas) in 2011, 621 acres treated mechanically in 2012, 300 acres of conifer removal in 2013, and 320 mechanical treatment acres (including mechanical treatment of aspen understory and conifer removal) in 2014. Merchantable timber from mechanical treatments is salvaged and used by a local sawmill, while non-merchantable timber is either cut and scattered or skidded into burn piles. Some material is also used for stream restoration and aquatic habitat improvements in the Little Snake River. The USGS has been monitoring the effectiveness of the aspen treatments conducted on public land since 2008 and continues to do so.

In addition to the restoration of aspen communities, intended outcomes of the project include enhanced watershed and ecosystem function and improved fish and wildlife habitat for the estimated 120 species utilizing the aspen habitat in this area. Livestock are also expected to benefit from an increase in herbaceous understory forge resulting from the aspen treatments. The project also reduces catastrophic wildfires risk. Partners include permittees, LSRCD, WGFD, BLM, NRCS, USFS, U.S. Fish and Wildlife Service (USFWS), The Nature Conservancy (TNC), the Mule Deer Foundation, Bow Hunters of Wyoming, Rocky Mountain Elk Foundation, and WWNRT.

2. Aspen Fringe Mapping, Assessment and Treatment

WLCI partners have identified smaller, more isolated ecotonal aspen stands in Carbon County as a priority for conservation in addition to the larger contiguous stands in and near the Medicine Bow National Forest. A rapid bioassessment of fringe aspen in the geographic area was contracted out of the Wyoming Natural Diversity Database (WYNDD) and completed. A prescribed burn that targeted fringe aspen in the Cow Creek vicinity was completed by the BLM in 2003, and the Little Snake – Savery Aspen (WLCI-funded) project has targeted fringe aspen in the Upper Muddy Creek drainage. Objectives for fringe aspen conservation within the geographic priority area include reconnecting isolated stands, extending stands into riparian zones, increasing regeneration and diversifying age stand structure. Although stands have been mapped and a rapid bioassessment has been conducted, plans for treatment over the next five years may be inhibited by sage-grouse core habitat disturbance stipulations.

Timeframe: At least 5 years.

Relationship to Existing Plans and Other Actions

- BLM Rawlins Resource Management Plan (Bureau of Land Management, 2008)
- Medicine Bow National Forest Plan (U. S. Forest Service, 1985)
- WGFD Strategic Habitat Plan (Wyoming Game and Fish Department, 2009)

Shirley Basin Geographic Priority Area

Environmental Setting

The Shirley Basin Geographic Priority Area (see figure 3-9) is located in northeastern Carbon County. It includes a large portion of the Medicine Bow River, a priority stream identified by the Carbon LPDT. The Nature Conservancy (TNC) notes the basin's importance for harboring some of the world's last intact grasslands, and WGDF has identified the crucial habitat as warranting protection in its Strategic Habitat Plan (Wyoming Game and Fish Department, 2009). The area's relatively intact crucial grasslands and sagebrush communities support a wide variety of obligate species including numerous Species of Greatest Conservation Need. It includes portions of the Hanna and Alcova sage-grouse core areas, historic sage-grouse ranges outside of core areas, crucial and year-round ranges for the largest pronghorn herd in the state, crucial winter range for mule deer, and habitat for the only wild population of endangered black-footed ferrets *(Mustela nigripes)* in the state. Much of this habitat sits on large tracts of private lands where long-term protection can still be achieved across a landscape. This portion of Carbon County has high existing and potential levels of energy development. Five wind farms have been constructed, Wyoming segments of the Gateway West transmission line have been approved, and developing proposals include numerous wind energy projects as well as the construction of a coal to liquid refinery.

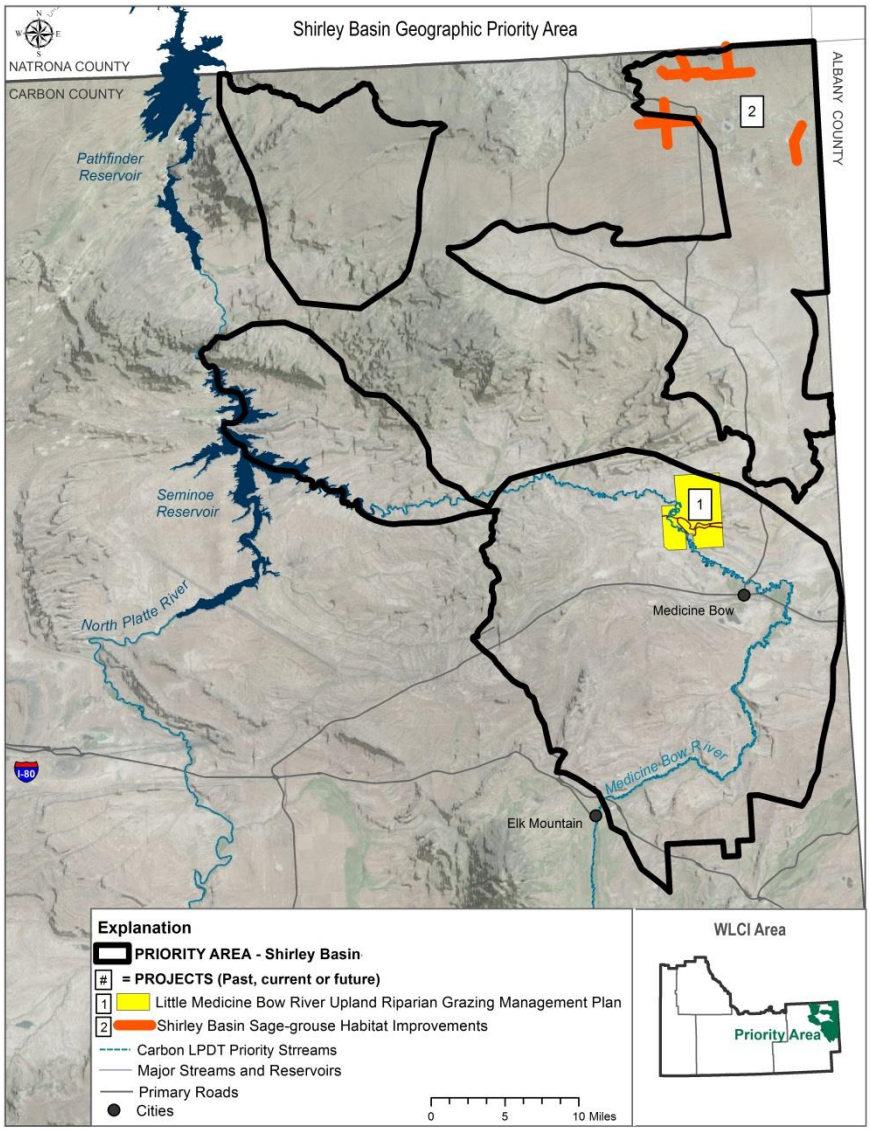

Figure 3-7. Shirley Basin Geographic Priority Area and projects

Issues

- **Sagebrush habitat degradation:** This area contains portions of two sage-grouse core areas. The northern portion of the basin provides excellent wintering habitat for sage-grouse and is in close proximity to the approved Gateway West transmission line segment location. Sagebrush and Gardner's saltbush (Atriplex gardneri) communities are in poor condition, having experienced persistent drought and overuse by pronghorn. The herbaceous understory in many of these communities is also in poor condition.
- **Riparian habitat degradation:** Partners have identified over-use of riparian areas as an issue for the geographic priority area, and some riparian habitats have reportedly failed to meet Healthy Rangeland Standards. Woody species in the area lack age class diversity and heavy water use has altered natural stream flows, affecting the ability for cottonwoods to regenerate on the Medicine Bow River and Rock Creek. Tamarisk invasion has also contributed to degraded riparian habitats.
- **Invasive plant species:** Tamarisk (*Tamarix ramosissima)* has invaded riparian zones of the Medicine Bow River, and the Medicine Bow Conservation District has identified this as a priority issue. Additional invasive species in the geographic priority area include pepperweed *(Lepidium spp.)* and Russian knapweed *(Acroptilon repens)*. Carbon County Weed and Pest District has defined four Coordinated Weed Management Areas in this vicinity: Elk Mountain, Hanna, Medicine Bow and Rock Creek. TNC identifies the reduction of invasive plant species as a key strategy to maintaining the area's high quality grassland, wetland, and riparian habitats.
- **Conifer encroachment:** Conifer encroached aspen in the Shirley Mountains are of concern for this area. Lack of fire and historic fire suppression has allowed conifers to compete for resources with aspen.

Conservation Actions and Intended Outcomes

1. Little Medicine Bow River Upland/Riparian Grazing Management Plan

The Little Medicine Bow River Upland/Riparian Grazing Management Plan project is designed to restore over-utilized vegetative communities in two phases. The WLCI is funding the Medicine Bow Conservation District's proposal for added infrastructure in 2014 as part of phase two. The primary objective of the project is to develop a grazing plan that optimizes the health and vigor of both the upland and riparian communities to maintain ranching operations while improving upland, riparian, and aquatic habitat for a diversity of terrestrial and aquatic species.

Phase one included the installation of 1.8 miles of wildlife-friendly fence that limits grazing within a 139.5-acre riparian pasture. The fence protects natural springs and allows a stunted willow community to rejuvenate. Phase two will shift the timing and intensity of grazing away from areas that need rest. Range assessments, vegetation inventories, and plan development in 2012 for the area rapidly identified that added infrastructure (i.e. cross-fencing, water development, and fence tagging) is needed to provide significantly higher habitat benefits over the entire project area. Infrastructure needs include the installation of approximately 7 linear miles of wildlife-friendly fencing with intermittent sections of lay-down fence that will pass mule deer, pronghorn (crucial range), and elk to ensure overland migration corridors are maintained. A mile of new fencing was installed in 2014 to protect riparian vegetation and to facilitate cattle and wildlife access to water and to implement a river crossing.

Fencing from both phases will allow the existing 11,256-acre pasture unit to be broken into three upland and two riparian pastures which will further expand range planning capabilities. The riparian pasture will be rested from grazing for several years to promote the recovery of existing riparian plants and lower water temperature in the aquatic habitat. Potential water development for upland pastures is being explored by a NRCS geologist. The WLCI project proposal includes funding needed to drill two test wells, provided this is not cost prohibitive. Water development in the uplands would eliminate the need for water gaps in the riparian fence that would otherwise be needed to sustain cattle. Access to water in distant uplands will allow the grazing planner to expand their conservation strategy and further improve the health and vigor of upland grasses. Additional intended outcomes of the project include improved thermal cover for fish, and river and riparian zone stabilization on the Medicine Bow River and Rock Creek.

2. Shirley Basin Sage-Grouse Habitat Improvements

Objectives for this 2011 continuing project focus on bringing upland and riparian vegetation, wildlife habitat, and watershed health towards a condition that will benefit sage-grouse. The Shirley Basin contains both core areas and historic sage-grouse ranges. The BLM and project partners have identified this area and project as having potential to improve nesting habitat as well as brood rearing habitat for greater sage-grouse.

Habitat conditions in the basin often center on multiple use management, including domestic livestock and wildlife, so that the standards for rangeland health on both uplands and riparian areas are met. The area was reviewed for conformance with the Wyoming Standards and Guidelines for Healthy Rangelands in 2005-2006. While the majority of the area met the standards, portions failed to meet riparian standards. Concerns were raised in the assessment that in some cases, upland habitat may not be at or moving towards a "desired future condition". Furthermore, historical sheep use areas have many fencelines which do not meet BLM and/or WGFD standards for wildlife passage. Conservation actions to address these issues include the development and protection of between 3-4 naturally occurring spring sites within the project boundaries. Construction of approximately 15 miles of wildlife-friendly pasture fencing is proposed to convert livestock grazing permits from summer, season-long use to rotated grazing systems incorporating deferment and recovery periods. Additionally, up to 10 miles of pipeline and 5 new water troughs are proposed to service resulting pastures and to better distribute livestock use. Between 2011 and 2013, eight miles of wildlife-friendly fencing were built to promote rangeland standards in core areas and facilitate wildlife movement and migration. In 2013, approximately 7,300 feet of pipeline were installed to provide water to newly created pastures. The remaining seven miles of the proposed 15 miles of fencing is planned for completion.. The BLM rangeland management specialist has developed a monitoring plan, and photo points. Sage-grouse lek data is collected in the surrounding project area and lek monitoring will continue in future years as well.

These actions address priority area issues on a landscape scale beyond the project boundaries by complimenting several water development efforts, fence modifications, and vegetation treatments within the area (i.e. Petrified Forest Allotments and 7-E Ranch) which have also been implemented to improve sage-grouse habitat. Project partners include the BLM, current landowners, permittees, Medicine Bow Conservation District, and WGFD.

<u>Additional Conservation Actions by WLCI Partners</u>

- A local sage-grouse working group has been established for the Bates Hole/Shirley Basin area to “develop and implement strategies that maintain and improve sagebrush communities for sage-grouse and other species” (Bates Hole/Shirley Basin Sage-grouse Working Group, 2007). The group has conducted an assessment and developed strategies for conserving sage-grouse in the area. Their conservation plan develops management strategies to:
  - Maintain, restore and/or enhance sage-grouse habitat.
  - Manage factors contributing to the direct mortality of sage-grouse.
  - Initiate and/or encourage sage-grouse research.
  - Monitor sage-grouse populations and habitat characteristics to determine status and trends.
  - Increase public awareness, knowledge, and support of sage-grouse conservation.

  Conservation commitments, proposed management actions, and recommended management practices to achieve goals and objectives are listed in the plan.
- Tamarisk has been treated with reported success by the Medicine Bow Conservation District on the Medicine Bow River upstream of Seminoe Reservoir. The Bureau of Reclamation has also conducted treatments along the shores of Seminoe Reservoir. Most success was achieved with a myriad of methods to control the species including mechanical, hand, and aerial treatments.
- Medicine Bow Conservation District has targeted two areas for cottonwood restoration, both close to the area where the streams cross I-80 in the southern portion of the Shirley Basin Geographic Priority Area.
- Medicine Bow Conservation District, with the help of BLM, will be constructing additional fences and developing additional water supplies at numerous grazing allotments in northeastern Carbon County.

<u>Timeframe</u>

Many of these proposed actions will occur throughout the life of the WLCI Conservation Action Plan timeframe of five years and well into the future.

Relationship to Existing Plans and Other Strategies

- Bates Hole/Shirley Basin Sage-grouse Conservation Plan (Bates Hole/Shirley Basin Sage-grouse Working Group, 2007)
- BLM Rawlins Resource Management Plan (Bureau of Land Management, 2008)
- Shirley Basin-Laramie River Conservation Action Plan (The Nature Conservancy, n.d.)
- WGFD Strategic Habitat Plan (Wyoming Game and Fish Department, 2009)

Upper Muddy Creek/Grizzly Special Management Area

Environmental Setting

The BLM has defined 59,720 acres of public land in southern Carbon County as the Upper Muddy Creek/Grizzly Special Management Area (see figure 3-8) in its Rawlins Resource Management Plan (RMP), and the WLCI geographic priority area incorporates state and private land within its boundaries as well. Goals for the area include managing habitat for the Colorado River fish species unique to the Muddy Creek Watershed and managing crucial winter habitat for elk and mule deer (Bureau of Land Management, 2008). It includes the Grizzly section of the Red Rim Wildlife Habitat Management Area (WHMA), where management emphasizes riparian habitat enhancement and watershed restoration. Muddy Creek is a 97-mile long tributary to the Little Snake River that rises in the Sierra Madre Mountain Range and supports a unique assemblage of both cold and warm water native fish species. WGFD has identified it as one of five priority subdrainages for the management of the sensitive native warm water species collectively referred to as the "three species" (bluehead sucker, flannelmouth sucker and roundtail chub). Colorado River cutthroat trout historically occupied waters of the upper Muddy Creek drainage, and numerous partners have collaborated in reintroduction efforts here. To protect the reintroduction area, the BLM has reported 4,520 acres of public lands and 69,770,000 tons of federal coal as unsuitable for further leasing consideration. Muddy Creek has been the focus of careful livestock management, riparian enhancement and protection efforts, and riparian monitoring to maintain or improve stream conditions. The Upper Muddy Creek/Grizzly Special Management Area overlaps portions of two other WLCI geographic priority areas: 1) Baggs Big Game/Terrestrial Enhancement, and 2) Medicine Bow & Fringe Aspen.

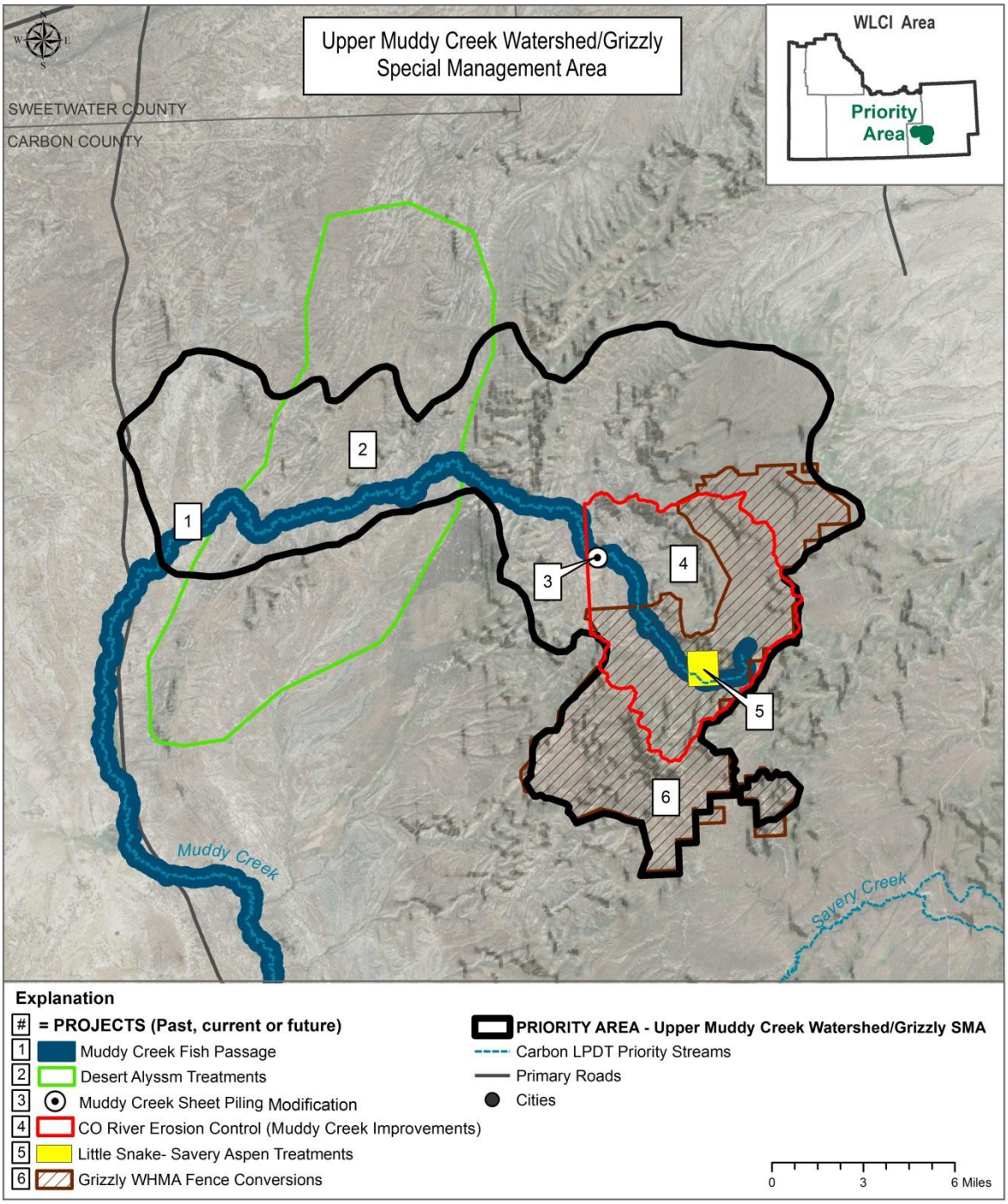

Figure 3-8. Upper Muddy Creek/Grizzly Special Management Area and projects

Issues

- **Sensitive native fish populations:** Muddy Creek and its tributaries provide habitat for sensitive cold and warm water native fish species whose populations have drastically declined range-wide. Muddy Creek is the only system in Wyoming where viable populations of BLM sensitive Colorado River cutthroat trout, bluehead sucker, flannelmouth sucker, and roundtail chub coexist. There are numerous threats to the populations in Muddy Creek including hybridization/competition with non-native species, habitat fragmentation from in-stream structures, and habitat loss and degradation. WGFD's designation of Muddy Creek as a priority

subdrainage for "three species" management signifies the need for the conservation of these species and their habitats (Senecal, Gelwicks, Cavalli, & Keith, 2010). CRCT historically occupied waters of the upper Muddy Creek drainage, and restoration of genetically pure CRCT to this part of the species' historical range has required reintroduction efforts (Young, Schmal, Kohley, & Leonard, 1996).

- **Fish barriers:** In-stream structures on Muddy Creek and its tributaries impede fish passage and fragment native fish habitat. Numerous fish barriers have been identified that limit upstream fish movement including four galvanized metal sheet piling structures, barriers previously installed as part of non-native fish removal efforts, and stream gradient control structures.
- **Aquatic and riparian habitat degradation:** Modification to instream habitat has occured as a result of a series of anthropogenic structures which have caused sedimentation, bank widening, and habitat fragmentation. WGFD reports that existing land use practices are negatively impacting watershed conditions in much of the upper Muddy Creek watershed. Factors include coal-bed methane/natural gas and wind energy development. Stock water pond developments are impeding tributary spring and stream flow to Muddy Creek, and willow and aspen riparian vegetation is in need of restoration (Wyoming Game and Fish Department, 2009).
- **Migration corridor maintenance and big game passage:** Non-wildlife friendly fencing impedes big game passage in the geographic priority area, causing wildlife stress, injury and mortality. Existing fences on the Grizzly Wildlife Habitat Management Area impede big game migrations between transition season habitat and crucial winter range, as well as pronghorn home range movements during summer months. WGFD has reported that existing fencing appears to act as a movement barrier to young mule deer fawn and elk calves attempting to utilize various rearing habitat on the Grizzly WHMA.
- **Crucial winter range habitat degradation:** Approximately 40,000 acres of mule deer crucial winter range in the Baggs area on public land were evaluated in 2001 as not meeting rangeland health standards. Treatments to remedy this issue have to date been very small scale and greater attention is needed.
- **Invasive plant species:** Desert alyssum *(Alyssum desertorum)* and halogeton *(Halogeton glomeratus)* are reportedly competing with native vegetation within the Muddy Creek Watershed. Monitoring transects in the area have shown a decrease in perennial plant spacing and production where alyssum dominates. Partners have also identified cheatgrass, saltcedar, black henbane, and Canada thistle invasions.
- This area overlaps portions of two other WLCI geographic priority areas, each with its own set of issues. See the narratives for Baggs Big Game/Terrestrial Enhancement, and Medicine Bow & Fringe Aspen geographic priority areas for details on additional issues.

1. Muddy Creek Fish Passage

The BLM in cooperation with Trout Unlimited (TU), WGFD, and the LSRCD, have undertaken a large conservation effort to protect native Colorado River fish species in the Muddy Creek watershed. This project is part of an ongoing large-scale effort to restore fish passage and repair degraded stream channels to reconnect over 34 miles of fragmented aquatic habitat for CRCT as well as bluehead suckers, flannelmouth suckers, and roundtail chub. The project goals are to remove or modify existing in-stream structures to allow fish passage while maintaining stream grade and function of original structures, and to improve or reconstruct critical barriers needed for long-term management of sensitive fish species within the watershed.

Efforts include the removal or modification of over 14 in-stream structures on Muddy Creek and Littlefield Creek previously installed as part of non-native fish removal efforts or stream gradient controls, and construction of fish barriers to protect restored sections of stream. Methods also include channel construction, in-stream rock installation and planting of riparian vegetation to improve in-stream and riparian habitat. In 2011, engineered design plans for the removal of the Littlefield Creek fish barrier were developed, and additional fish barriers were identified in the watershed. Non-native brook trout *(Salvelinus fontinalis)* were captured upstream of an existing barrier, potentially compromising the implementation of the Littlefield fish barrier removal. During fiscal year 2012, an engineered design for the Littlefield Creek fish barrier was modified and completed. Engineered designs for the modification/construction of two fish barriers were also developed. These barriers must be constructed to protect the native fish population prior to the removal of any fish barriers upstream. Habitat and population monitoring of past and future project areas occurred in 2012 and 2013. Construction of the two barriers designed in 2012 is planned for the future, and monitoring will continue. Efforts to remove or modify the remaining identified fish barriers, construct new barriers, and reconnect the 34 total miles of fragmented habitat are anticipated to

continue through the five year duration of the Conservation Action Plan. Partners have reported plans to actively pursue opportunities to expand reintroduction efforts for Colorado River Cutthroat Trout (CRCT) and other native cold and warm water fishes into adjacent habitats within the Upper Muddy Creek watershed.

This project addresses the Upper Muddy Creek/Grizzly SMA issues of sensitive native fish populations, fish barriers, and aquatic and riparian habitat degradation. It connects and restores fragmented aquatic habitat, providing the ability for BLM sensitive species to move upstream and seek out habitats important for fulfilling life history requirements. Fish passage improvement is critical to the conservation of the four BLM sensitive fish species within the Muddy Creek watershed. Ensuring that segments of stream are reconnected in a timely manner in coordination with WGFD non-native fish removal efforts will contribute to the long term success of reintroduction and conservation efforts in the Muddy Creek watershed.

2. Inventory and Control of Desert Alyssum

See the Baggs Big Game Corridor/Terrestrial Enhancement Geographic Priority Area narrative (Conservation Actions and Intended Outcomes section) for project details. This project addresses the issues of invasive plant species and crucial winter range habitat degradation for the Upper Muddy Creek/Grizzly SMA.

3. Muddy Creek Sheet Piling Modification

The BLM has collaborated with Trout Unlimited (TU), WGFD and LSRCD to modify four galvanized metal sheet piling structures that were acting as barriers to upstream fish movement. Additional rock ramp structures have been placed in the stream to maintain the water table and allow for fish passage. This project is part of an ongoing effort to restore BLM and state sensitive native CRCT to the Muddy Creek watershed.

Prior to the implementation of this project, at least 12 grade-control structures have been installed in upper Muddy Creek to improve riparian conditions impacted by past channel incisions. However, a recent barrier assessment conducted by TU and the BLM has shown most of these structures to be barriers to upstream migration of native fish. WLCI funding for this project assists with the design and implementation of different passage options for installation on grade-control structures consisting of sheet piling. This project began in 2011, when project design was completed by One Fish Engineering and reviewed by cooperating partners. In 2012, sheet piling modifications were completed and rock ramp structures were placed in the stream, reconnecting an additional 8 miles of stream for native BLM sensitive fish species in the Muddy Creek watershed. Monitoring of fish passage over structures continues by marking fish below each structure and then monitoring upstream areas to determine if native fish successfully pass each structure. Funding provided in future years would allow for modification of additional sheet piling structures in Muddy Creek.

This project addresses the Upper Muddy Creek/Grizzly SMA issues of sensitive native fish populations, fish barriers, and aquatic and riparian habitat degradation. It increases the population viability of sensitive species in the priority area. Reconnecting 8 miles of fragmented aquatic habitat provides the ability for BLM sensitive species to move upstream and seek out habitats important for fulfilling life history requirements. Identifying which options best facilitate passage by native fish is critical to inform future projects on remaining grade-control structures throughout Muddy Creek as identified during barrier assessments. Therefore, the project's design efforts and effectiveness monitoring will inform subsequent phases of Muddy Creek restoration.

4. Colorado River Erosion Control (Muddy Creek Improvement Project)

This project consists of multiple components that address watershed health on Muddy Creek. Objectives include: 1) construct right-sized in-stream fish habitat improvement structures for sensitive warm water fish species, armor head cuts and hydrologic nick points using rock masonry and induced meandering techniques, 2) remove decrepit fences in the upper Muddy Creek watershed, 3) complete aspen removal in a prescribed burn area, 4) assist with hauling the aforementioned aspen to an existing beaver population for dam materials, and 5) retrofit an existing spring exclosure in the same area. Additional project components include wildlife friendly fencing conversions and reducing sediment into Muddy Creek through sediment and erosion control involving road improvements.

In 2008, 6.5 miles of steel post fence and 2.2 miles of wood post and rail top fence in the Grizzly/Sandhills area were converted to meet wildlife friendly standards. Road improvements and gravel placement reduced erosion into Muddy Creek and a culvert placement was completed to improve a county road and reduce erosion. The Wyoming Conservation Corps installed rock dams on Muddy Creek below a culvert crossing planned for removal to restore fish movement between Muddy Creek and Littlefield Creek. They also cut and transported aspen to Littlefield and Muddy Creeks to provide larger materials for beavers to utilize in dam construction. The crew also repaired and expanded one spring exclosure and one portion of a riparian pasture fence at the headwaters of Littlefield Creek, and removed old riparian pasture fencing around the fish barrier on Littlefield Creek. In 2010, riparian vegetation was ordered from the Upper Colorado River Environmental Plant Center and exclosure materials were purchased. In 2011, riparian vegetation plantings occurred and planning was developed for road improvements. In 2012, funding was used to purchase culverts for use in 2014, and the BLM Wild Horse Road was re-routed to benefit wildlife, primarily mule deer that utilize migration corridors in the vicinity. In 2013, engineering and hydrology consultation and planning took place, and roadwork along Muddy Creek was completed. Twelve 18" x 30' culverts and one 36' x 30' culvert were installed within a two mile section of road. Additional road work adjacent to McKinney Creek will be addressed in the future.

This project addresses the Upper Muddy Creek/Grizzly SMA issues of sensitive native fish populations, fish barriers, aquatic and riparian habitat degradation, migration corridor maintenance, and big game passage. Removal of barriers and the development of appropriately sized low-tech habitat improvement structures improve the ability of sensitive warm water fish species to move more freely through the system and ideally enable population increases. Aspen enhancement within the Muddy Creek watershed affords considerable water return to the watershed, improving overall watershed health and benefiting both aquatic and terrestrial species. Retrofitting spring developments that have outgrown their original design or have been neglected has proven effective for keeping grazing pressure off the riparian area. This project also facilitates big game movement and reduces stress, injury and mortality caused by non-wildlife friendly fence impediments. Partners include BLM, Carbon County, WGFD, LSRCD, RMEF, WWNRT, WY State Land Board, and permittees.

5. Little Snake – Savery Aspen Treatments

See the Medicine Bow & Fringe Aspen Geographic Priority Area narrative (Conservation Actions and Intended Outcomes section) for project details. This project addresses the issues of aquatic and riparian habitat degradation and sensitive fish species (as it relates to CRCT habitat improvement).

6. Red Rim - Grizzly WHMA Fence Conversions

See the Baggs Big Game Corridor/Terrestrial Enhancement Geographic Priority Area narrative (Conservation Actions and Intended Outcomes section) for project details. In addition to addressing the priority area issues of migration corridor maintenance and big game passage, the project contributes to the 38,000-acre WHMA's effectiveness by playing a role in meeting its wildlife enhancement objective. WLCI is funding another project on the other portion of this WHMA (Red Rim – Daley WHMA is managed in conjunction with Rid Rim – Grizzly WHMA). The objectives of the 2014 Red Rim – Daley Wildlife Habitat Management Area Improvements project are to improve the vegetative structure of the Red Rim WHMA and to conduct habitat improvements for wildlife. Although the Red Rim – Daley project does not overlap with this WLCI geographic priority area, each of these projects contribute to the other's success and the effectiveness of the Red Rim WHMA as a whole.

<u>Additional Conservation Actions by WLCI Partners</u>

- The BLM, WGFD, USFS and other members of the Muddy Creek Coordinated Resource Management (CRM) group have joined in collaborative efforts to improve stream conditions, remove non-native fish and reintroduce genetically pure CRCT to the upper Muddy Creek watershed. The first reintroduction of CRCT on BLM lands in southern Wyoming occurred in 2001 when approximately 500 CRCT were released into Littlefield Creek. The USGS is conducting water-resource monitoring on the Muddy Creek in cooperation with State and other Federal agencies in response to concerns about energy development in the region. Water quality monitoring includes measuring stream flow, specific conductance, and the collection of water samples for laboratory

analysis of dissolved solids (DS) concentrations. By examining relations between measured specific conductance and DS concentrations in water samples, USGS scientists were able to develop a web-based tool that provides real-time DS concentrations for the Muddy Creek.

- Red Rim-Grizzly WHMA Forage Reserve Grazing -
  Six cattle operators graze the WHMA under the cooperative management of the WGFD and BLM in a restoration grazing plan designed to benefit wildlife habitat values inside the WHMA and adjacent habitat to the WHMA boundary.
- BLM Rawlins Field Office Weed Management -
  A project was initiated by the BLM in 2008 to treat the spread of cheatgrass along BLM roads in the Grizzly Habitat Management Area before it started invading the native rangeland. Black henbane and Canada thistle were added to treatment efforts, and known saltcedar has been treated in the vicinity of Muddy Creek as well.

Timeframe

Many of these proposed actions will occur throughout the life of the WLCI Conservation Action Plan timeframe of five years and well into the future.

Relationship to Existing Plans and Strategies

- BLM Rawlins Resource Management Plan (Bureau of Land Management, 2008)
- Conservation agreement for Colorado River cutthroat trout in the States of Colorado, Utah and Wyoming (CRCT Conservation Team, 2006)
- WGFD Short-term Plan for the Three Species on the Green River Drainage of Wyoming (Senecal, Gelwicks, Cavalli, & Keith, 2010)
- WGFD Strategic Habitat Plan (Wyoming Game and Fish Department, 2009)

Upper North Platte Geographic Priority Area

Environmental Setting

The Upper North Platte Geographic Priority Area (see Figure 3-9) encompasses 986,275 acres of federal, state and private land in southeast Carbon County. The watershed provides a high diversity and abundance of aquatic and terrestrial wildlife habitat types including stream, riparian, wetland, sagebrush, grassland, aspen, conifer, meadow and mixed mountain shrub. It provides crucial winter range for elk and mule deer, and spring, summer and fall range for mule deer and pronghorn. It contains sage-grouse core habitat and supports numerous migratory bird and SGCN species. Partners have identified several conservation priorities within this large watershed, including the Encampment River corridor, the North Platte River corridor, Pennock Mountain WHMA, and mule deer habitat. Both Trout Unlimited and the Saratoga/Encampment/Rawlins Conservation District have highly prioritized the Encampment and upper North Platte rivers for aquatic conservation. Carbon Weed and Pest Control (CWPC) has also prioritized the North Platte River, specifically targeting the Colorado/Wyoming border to Seminoe Reservoir for invasive plant control. The Platte Valley Mule Deer Initiative continues habitat management and enhancement efforts throughout the area and its members are actively engaged with the WLCI. WGFD has identified the Upper North Platte watershed as a combined aquatic/terrestrial crucial habitat priority in its Strategic Habitat Plan (Wyoming Game and Fish Department, 2009). The plan highlights the importance of conserving its wildlife values from threats including habitat degradation and fragmentation caused by a mountain pine beetle epidemic and residential and industrial energy development.

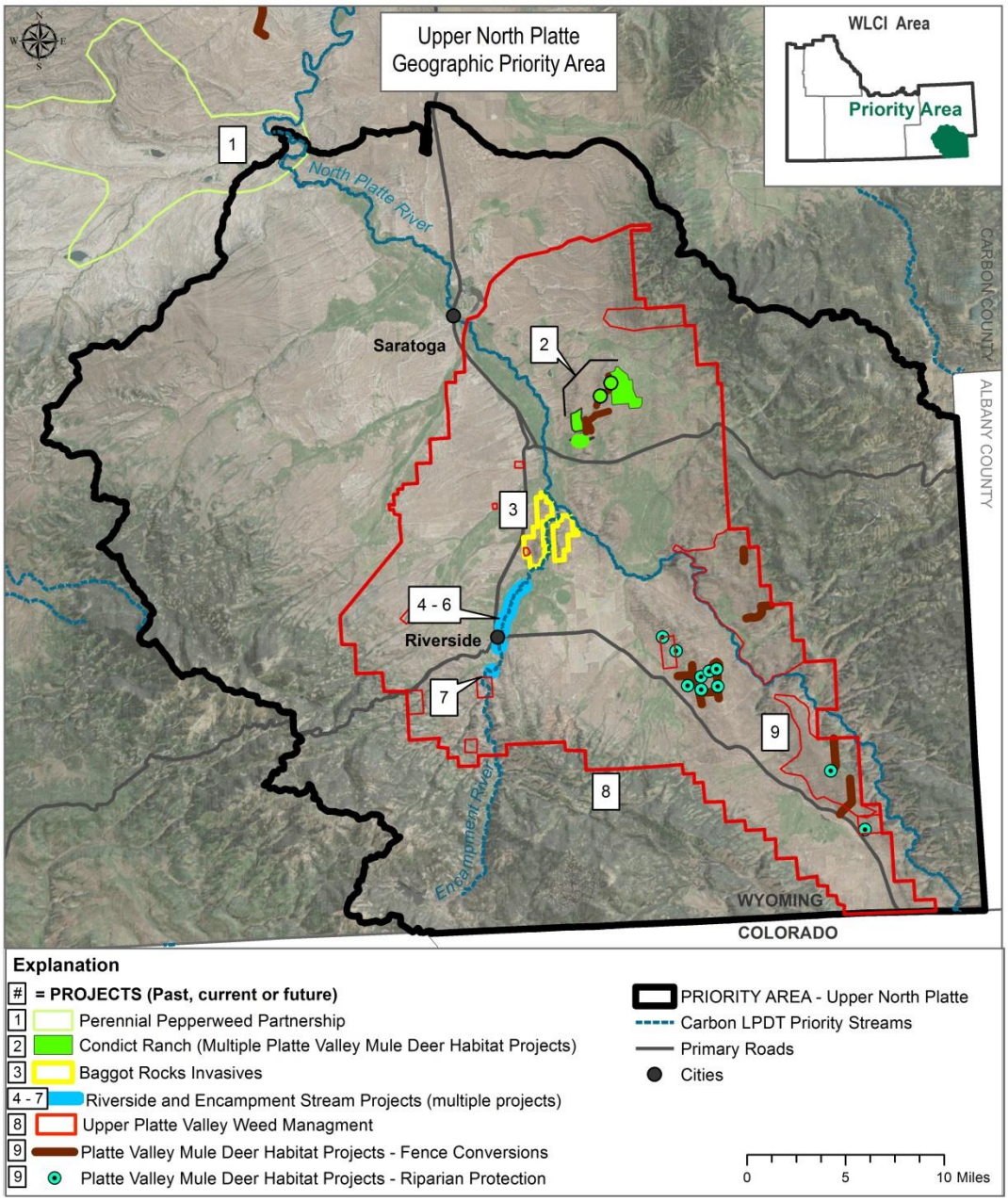

Figure 3-9. Upper North Platte Geographic Priority Area and projects

Issues

- **Invasive plant species:** Numerous partners have identified invasive species issues throughout the priority area. The BLM has reported leafy spurge, thistles, spotted knapweed (*Centaurea stoebe*), and other weeds on approximately 500 acres within the upper Platte Valley. WGFD has reported moderate to severe cheatgrass invasions on many big game winter ranges as well as juniper invasions into mixed shrub communities. CWPC has identified issues of saltcedar, Russian olive and leafy spurge invasions on the North Platte River between the Colorado/Wyoming border and Seminoe Reservoir. Perennial pepperweed, Russian knapweed, whitetop, marsh sowthistle *(Sonchus arvensis)*, saltcedar, and leafy spurge have invaded the Sage Creek watershed as well.
- **Platte Valley mule deer population decline and habitat degradation:** The Platte Valley mule deer population has been declining since approximately 2006. This decline is due to a combination of issues

identified in the Platte Valley Mule Deer Plan, including degraded habitat conditions. Winter habitat condition is considered the limiting factor in mule deer population growth in the Platte Valley herd (Wyoming Game and Fish Department, 2012). Crucial winter ranges in the area are reportedly in poor condition as a result of long-term drought and current and historic over-use by mule deer and other ungulates. Many winter ranges have moderate to severe cheatgrass invasion, and some have juniper invasions as well. Transitional mule deer shrub habitats were noted as being composed of even-aged mature shrub stands moving towards decadence in many cases. Some transitional ranges including mountain shrub, riparian, aspen and lower elevation conifer habitats are reportedly in need of enhancement. The Baggot Rocks winter range failed to meet wildlife habitat and upland Standards for Healthy Rangelands in 2005, and the Platte Valley Mule Deer Habitat Assessment: Southern Section 2008 Final Report reports shrub over-utilization in the area. Spring, summer, and fall ranges are undergoing changes as pine beetle infestations alter high elevation forests. (Wyoming Game and Fish Department, 2009).

- **Migration corridor maintenance and big game passage:** Non-wildlife friendly fencing impedes big game passage within mule deer migration corridors, transitional and winter ranges, causing wildlife stress, injury and mortality.
- **Declining mountain shrub and sagebrush communities:** Most low elevation big sagebrush-grassland communities lack age class diversity (are in a late seral stage with few young sagebrush) and lack understory cover and diversity. The Platte Valley Mule Deer Habitat Assessment: Southern Section 2008 Final Report describes the shrubs in the Baggot Rocks winter range complex as over-utilized with little to no reproduction. Juniper has also invaded mixed shrub communities in this and other areas. Lack of fire in some mountain shrub (and aspen) communities is limiting the ability of the communities to maintain themselves.
- **Fish barriers:** In-stream structures including irrigation diversion dams impede fish passage and fragment native fish habitat. Numerous fish barriers have been identified that limit upstream fish movement on the Encampment River.
- **Aquatic and riparian habitat degradation:** Partners have reported fragmented aquatic habitat and overuse of riparian habitat with limited cottonwood and willow regeneration in riparian areas. The North Platte River is bottlenecked near the town of Saratoga, restricting the stream and causing stream bank instability, head cutting, and sedimentation. Sage Creek was listed as a 303d impaired stream until 2008 due to habitat degradation. Portions of the North Platte watershed failed to meet riparian standards when the area was reviewed for conformance with the Wyoming Standards and Guidelines for Healthy Rangelands in 2004 and 2005. The Encampment River channel near Riverside is highly unstable with long stretches of bank erosion, extensive mid-channel and transverse bar development, channel degradation and aggradation. The channel degradation is lowering the water table and leading to a decrease in deep-rooted native riparian vegetation. The unstable channel and streambanks have led to degraded riverine habitat for aquatic species, and diminished riparian habitat for both amphibious and terrestrial species.

Conservation Actions and Intended Outcomes

1. Perennial Pepperweed Partnership

The Carbon County Perennial Pepperweed Partnership project is a collaborative effort between the BLM, CWPD, and the local landowner/permittee to treat two main stream branches in the Sage Creek watershed for perennial pepperweed, Russian knapweed, whitetop *(Cardaria draba)*, marsh sowthistle, saltcedar, and leafy spurge. The primary objective of the project is to control noxious weeds within the Sage Creek Watershed using chemical, biological and mechanical treatments. The watershed drains into the North Platte River which is currently free of perennial pepperweed.

This ongoing project began in 2011, when 600 acres were treated, an additional 200 acres were monitored, and 200 acres were inventoried. The same accomplishments were reported for 2012 as 2011, and in 2013, half of the project area was completed due to access and funding issues on private land. No new infestations were reported in 2012. In 2014, 150 acres were treated and 1,400 acres were inventoried. WLCI funds were used to treat the western portion of the project area, and the private landowner treated the eastern portion. Weed growth has slowed and weed patches are reportedly much thinner than found in previous years. Previously treated sites are monitored by

treatment crews and noted on their application records. The ocular monitoring method reportedly works well for tracking density and extent of patches from year to year. This ongoing project will continue treatments, inventory and monitoring in 2015.
This project addresses the Upper North Platte Geographic Priority Area issues of invasive plant species, Platte Valley Mule Deer habitat degradation, and riparian and aquatic habitat degradation. Intended outcomes include maintaining and restoring riparian and adjacent sagebrush/greasewood *(Sarcobatus vermiculatus)* habitat, and indirectly reducing sediment input to the streams and water uptake by weeds. The treatments are expected to improve the quality and quantity of forage for livestock and wildlife. The project area contains crucial winter range for deer and elk, and yearlong range for deer and antelope. It also contains sage-grouse wintering areas and brood-rearing habitat, numerous leks, and mountain plover habitat. To the north of this project, sagebrush improvement projects also benefit greater sage-grouse. Sage Creek had been listed as a 303d impaired stream due to habitat degradation until 2008, and weed treatments compliment other habitat improvement efforts for the area. These weed control efforts also prevent invasions onto the North Platte River, which is currently free of perennial pepperweed.

2. Condict Ranch (Platte Valley Mule Deer Habitat Management projects)

The overall goal of this project is to 1) provide protection of natural water sources and associated riparian zones while continuing to provide dispersed watering locations for livestock and big game, and 2) remove and/or modify existing barriers to wildlife migrations and movements. Identified objectives of the project are to 1) develop and protect between 3 to 4 naturally occurring spring sites within the project boundaries during 2011 and 2) convert 3 to 5 miles of pasture/allotment fencing each year.

This ongoing project began in 2011 with the successful drilling and capping of a well to provide water for wildlife and livestock. In 2012, a water storage tank and 5 miles of water pipeline supporting 7 new tire troughs were installed. Once completed, the new infrastructure will give the livestock operator the ability to rest a portion of the allotment which has been identified as important mule deer transition and winter habitat. Fence conversions will reduce impediments to wildlife migration to and from the Cedar Ridge area. Post construction monitoring will include photo points, vegetation transects, and utilization cages to help determine vegetation response. Monitoring will occur annually for the first 5 years post construction and them every 3-5 years depending on vegetation response and data needs.

The project addresses the Upper North Platte Geographic Priority Area issues of the Platte Valley Mule Deer population decline and habitat degradation, riparian and aquatic habitat degradation, and migration corridor maintenance and big game passage. It works toward achieving Healthy Rangeland Standards for riparian and upland areas, and contributes to the large-scale effort to address the declining Platte Valley mule deer population and their limited seasonal habitat (crucial winter and transitional ranges).

3.Baggot Rocks Invasives

Objectives of the Baggot Rocks Invasives project include 1) controlling the spread and prevalence of invasive plants within the winter range complex for mule deer on Baggot Rocks, 2) maintaining the area as a crucial winter range, and 3) lessening fire frequency. Baggot Rocks is one of the most important winter ranges in the Upper North Platte River Valley for the Platte Valley mule deer herd, as well as many of the deer from the North Park area of Colorado. WGFD has recorded both large numbers of deer here in the winter, as well as the poor condition of the habitat. The area failed The BLM allotment Healthy Rangeland Standards #4 and #3 (wildlife habitat and uplands) in 2005. The Platte Valley Mule Deer Habitat Assessment: Southern Section 2008 Final Report describes the area's shrubs as over utilized with little to no reproduction, and reports that cheatgrass has 4 times the relative frequency of the next most common grass. The area has a mixed shrub community of sagebrush and bitterbrush with an overstory of juniper that has expanded in range.

Plans for the project include the mechanical removal of 100 total acres of juniper and aerial spraying of cheatgrass with Plateau herbicide. Up to 400 acres of cheatgrass may be treated if funding is provided. In 2013, encroached junipers were removed from 3.5 acres of riparian drainages. Slash was piled and/or wind-rowed for controlled

burning. In 2014, the NEPA process was completed for targeted treatment areas. The awarded funding will be directed towards the removal of conifer encroached riparian habitat in 2015. The BLM will continue to monitor the treated grazing allotments based on previously established standards. Monitoring of benefits post-treatment will be conducted annually at permanent vegetative transect locations for the first 5 years. After 5 years, sites will be evaluated to see if goals have been met, and if further monitoring is required on an annual basis. Monitoring may only consist of photo points and occasional vegetative transect monitoring in years 5 through 25.

This project addresses the Upper North Platte Geographic Priority Area issues of invasive plant species and Platte Valley Mule Deer habitat degradation. It addresses numerous landscape priorities including 1) the maintenance of quality at crucial habitats, 2) aspen structure regeneration and reduction of encroached conifer species, 3) mountain shrub structure and regeneration, and 4) stream and riparian function. Treatments are expected to restore sagebrush and mountain shrub communities to ensure the sustainability of wildlife populations. The project works toward achieving Healthy Rangeland Standards for the area, and contributes to the large-scale effort to address the declining Platte Valley mule deer population and their limited seasonal habitat (crucial winter and transitional ranges). Partners include WGFD, BLM, WWNRT, and the Mule Deer Foundation.

4. A) Riverside Stream Enhancement and Restoration

The Riverside Stream Enhancement and Restoration is part of a large effort to improve aquatic and riparian habitat along the Encampment River. Initial objectives identified in 2011 included improving irrigation efficiency and enabling fish passage by replacing an existing cobble diversion dam with a fish friendly, low maintenance rock cross-vane structure. Existing cobble push-up dams cause river instability as well as fish barriers.

The Riverside Stream Enhancement project used a "Natural Channel Design" approach to assess and restore the stream channel and to stabilize it. Evaluation for Natural Channel Design formally began on this project in 2008 with the survey and design that was paid for by area landowners. The WLCI began funding the project when it was proposed in 2011. Conservation actions defined in 2011 included 1,100 feet of stream stabilization and/or flood plain creation, the installation of 5 stream revetments (rock cross vanes or rock barbs), and 10 willow clump plantings. In 2013, 1,300 feet of stream bank were treated to improve bank stability and reduce bank erosion, eight mini-vanes were constructed, a single A-frame type rock diversion structure was constructed, 300 feet of toe-wood and bankfull benches were installed, and a disturbed area (<2 acres) was re-seeded with a native riparian seed mix. The Saratoga-Rawlins-Encampment Conservation District (SERCD) will monitor with stream cross channel surveys and photo points every two years until 2020. Local landowners will maintain the diversion structure with a Maintenance and Operation agreement with SERCD for 15 years.

This project addresses the Upper North Platte Geographic Priority Area issues of fish barriers and aquatic and riparian habitat degradation. Grade control structures (cross-vanes, single arm vanes), toe-wood, channel shaping, bankfull benches, and riparian plantings are expected to provide stability within the stream reach. These treatments will decrease near-bank shear stress, while creating stable width/depth ratios and sediment transport. This project contributes to the larger effort of partners to improve aquatic and riparian habitat along the Encampment River. SERCD has completed 1,700 feet of stream restoration downstream 0.75 miles from this project. From that project end point, over 1.5 miles of additional stream restoration has been completed by TU, WGFD, local landowners and other partners. These projects are being undertaken to reconnect fisheries with spawning areas, stabilize stream banks, and reduce sedimentation. Partners contributing to the Riverside Stream Enhancement efforts include SERCD, WGFD, NRCS, WWNRT, TU, USFWS, Wyoming Governor's Big Game License Coalition (WGBGLC), and private landowners.

B) Boykin – Encampment River Restoration

The Boykin-Encampment River Restoration is a streambank stabilization and channel reconstruction project intended to improve channel stability for approximately 3,500 linear feet of river. It contributes to continuing river and riparian restoration efforts along the lower Encampment River to benefit wild brown and rainbow trout fisheries, as well as riparian habitat for wildlife, such as mule deer and wild turkey. The project is located between BLM Oddfellows Campground and the confluence with the North Platte. The project objectives for the Boykin

reach are: 1) establish a stable river course enabling the channel to adequately route sediment and improve stream connectivity for aquatic species, 2) improve streambank stability by decreasing the channel width/depth ratio, 3) improve channel pattern, increasing fish spawning success, and juvenile rearing and adult refuge habitat, especially during periods of low flow, 4) decrease adjacent land loss from excessive erosion and, 5) increase habitat for mammals, birds, and amphibians.

In 2013, 1,350 linear feet of stream channel was restored. Restoration efforts included installing streambank toe wood stabilization with bankfull benches; enhancing three pools; shaping three riffles; and installing a series of four rock vanes to help narrow a riffle, providing grade control and fish habitat enhancement. Additionally, the radius of curvature was modified on two meander bends. Riparian vegetation, willow stakes and clumps, were planted in the fall of 2013. A 77-acre riparian pasture along the reach was created in 2012 and grazing is deferred for at least the next three years. In 2014, approximately 1,000 feet of post-flood enhancement was completed through the use of riparian vegetation plantings of 300 riparian plants of various species. Monitoring efforts include cross-sections, longitudinal profile, and annual photo monitoring.

This project addresses the Upper North Platte Geographic Priority Area issues of fish barriers and aquatic and riparian habitat degradation. The restoration will decrease the width/depth ratio of the stream channel, improve bank stability and channel pattern, and enhance aquatic and riparian habitats. The expected decrease in sediment deposition along a narrower, deeper stream channel will create improved trout habitat and fish passage, especially during periods of low flow. This project contributes to the larger effort of partners to improve aquatic and riparian habitat along the Encampment River. Various partners plan to continue stream restoration/enhancement projects along the entire Lower Encampment River which is 14 miles. These projects are being undertaken to reconnect fisheries with spawning areas, stabilize stream banks, and reduce sedimentation. Partners for the Boykin – Encampment River Restoration include TU, WGFD, SERCD, WWNRT, USFS RAC, USFWS, WLCI, Wyoming Governor's Big Game License Coalition, and the private landowner.

C) Encampment River Stabilization

The objective of this 2014 project is to stabilize approximately 300 feet of the Encampment River's bank in order to return proper hydraulic function to the riparian area, decrease in-channel erosion, decrease downstream sedimentation, protect water quality, and improve aquatic habitat. High flow events in recent years have caused excessive in-channel bank erosion and sedimentation to occur which in turn has lead to a degradation of water quality and aquatic habitat. If left unattended, the bank will continue to cut and erode; potentially causing a large, high walled cut bank that will be more difficult to stabilize in the future.

This project will involve designing and installing four J-hooks and one rock cross vein as well as any reclamation of disturbed riparian habitat. Monitoring for continued stability of the project area will also be conducted after the project is completed. J-hooks and rock cross veins would prevent erosion by creating hydraulic conditions more conducive for natural bank building and stabilization. The BLM is working in conjunction with the NRCS and the adjacent landowner to plan, fund and implement this project, which is planned for completion within one year.

This project addresses the Upper North Platte Geographic Priority Area issues of aquatic and riparian habitat degradation. Successful stabilization of the degrading bank would improve overall channel stability and hydraulic function, decrease sedimentation, improve water quality, and improve fisheries and other aquatic habitat. This project contributes to the larger effort of partners to improve aquatic and riparian habitat along the Encampment River. These projects are being undertaken to reconnect fisheries with spawning areas, stabilize stream banks, and reduce sedimentation.

5. Upper Platte Valley Weed Management

The objectives of the Upper Platte Valley Weed Management project are to 1) reduce the expansion of known weed patches and eliminate where possible, 2) find and eliminate new patches, and 3) stop seed production of existing

patches. Treatments for this 2014 multi-year project will consist of the application of herbicide, and manual control of species including leafy spurge, thistles, and spotted knapweed on approximately 500 acres. One of the main goals is to prevent weed encroachment onto adjacent Forest Service and private lands.

Herbicide application, inventory, and monitoring were carried out on state, federal, and private lands in July and August of 2014. A total of 600 acres of private and BLM-administered land were treated. Approximately half of the known sites in the project area were treated, mostly in the Bennett Peak area. Treatments were also completed by ranch owners in 2014. Monitoring methods include photo point documentation and recording the extent, density, and condition of the patches. Photo points will be maintained to show trend in extent and density of weeds. Monitoring forms are entered into a GIS database so they are accessible to anyone needing to know the history of the treatments by patch. Treatments are planned from late May/early June through August of each year.

This project addresses the Upper North Platte Geographic Priority Area issues of invasive plant species and Platte Valley mule deer habitat degradation. It will help to maintain and protect sagebrush, mountain shrub, aspen and riparian communities from the introduction or expansion of weeds, benefitting the wildlife and livestock that utilize these habitats. The project area provides seasonal and crucial winter habitat for elk, mule deer, antelope and a few remaining bighorn sheep, and it also supports greater sage-grouse. Many of the private landowners (9) in the area have collaborated with the BLM for project implementation.

6. Riparian Habitat Improvement and Wildlife Friendly Fence Conversion in the Platte Valley (Platte Valley Mule Deer Habitat Projects)

The primary objective of this project is to improve habitat conditions in the Platte Valley by protecting degraded existing riparian areas (springs/seeps), and reducing wildlife movement barriers. Conservation actions consist of protecting approximately 10 springs/seeps by creating off-site watering (livestock/wildlife) from original sources. Riparian habitat enclosures will be constructed around each water source with wildlife friendly fencing. Additionally, approximately 17 miles of fencing that currently impedes wildlife movements are planned for conversion to wildlife friendly standards. The project supports the Platte Valley Habitat Partnership and the Platte Valley Mule Deer Initiative.

In 2014, fences were converted in the Chad, Severson Flats, Wilson Pasture, Big Hollow and Prospect Mountain allotments. Before and after photos were established along converted sections of fence line. Future plans include riparian protection efforts and monitoring. Current documentation of vegetation conditions in the allotments consists of historical and established photo points/transects. Some baseline vegetation data has been collected within specific project areas (i.e. vegetation diversity, ground cover, and wildlife browse utilization). These data will help associate project implementation with wildlife usage and vegetative response in specific project areas. Additionally, WGFD annually conducts big game counts and observations that may show changes in the future. WGFD is currently completing a mule deer collaring study, in the Platte Valley, that will help document wildlife movement corridors, and provide a baseline for movement changes resulting from proposed fence conversions. The project addresses the Upper North Platte Geographic Priority Area issues of the Platte Valley Mule Deer population decline and habitat degradation, riparian and aquatic habitat degradation, and migration corridor maintenance and big game passage. It works toward achieving Healthy Rangeland Standards for riparian and upland areas, and contributes to the large-scale effort to address the declining Platte Valley mule deer population and their limited seasonal habitat (crucial winter and transitional ranges). The riparian developments are intended to improve riparian habitat with increased plant species richness, diversity, density and abundance. Relieved grazing pressure will allow native riparian species to reestablish and expand, and prevent further soil compaction and sloughing. Water flows from springs/seeps are expected to increase in quality and quantity. Fence conversions will reduce stress and energy loss by big game species, and improve their ability to migrate to and from desired winter range habitat. Project partners include the BLM, SERCD, WGFD Platte Valley Habitat Partnership, WWNRT, the Local Sage-Grouse Working Group, RMEF, Water for Wildlife, the Mule Deer Foundation, and livestock permittees.

<u>Additional Conservation Actions by WLCI Partners</u>

- The Platte Valley Habitat Partnership (PVHP) was formed in May of 2012 as a result of the Platte Valley Mule Deer Initiative (PVMDI) that WGFD implemented in 2011. The PVHP was developed to establish effective partnerships in order to maintain and improve mule deer habitat throughout the Platte Valley. The PVHP's Mule Deer Habitat Plan (Platte Valley Habitat Partnership, 2013) outlines the work that has been, will be, and is planned to be completed to improve habitat conditions for mule deer in the Platte Valley.
- The Saratoga/Encampment/Rawlins Conservation District conducts water quality monitoring near the Colorado River. Information gathered may serve as baseline data for the anticipated oil development in the Platte River watershed in Colorado over the next several decades.
- The BLM conducted weed treatments in the upper North Platte River valley for leafy spurge, musk thistle, Canada thistle, yellow toadflax, and other invasive species in 2010. Increased inventory efforts were also reported.
- The BLM High Desert District plans to conduct several prescribed fires in 2015. The Prospect Mountain burn includes roughly 350 acres of mixed mountain shrubs and aspen stands in mule deer and elk transitional ranges along the edge of the Medicine Bow National Forest southeast of Riverside, Wyoming. This is a continuation of a prescribed burn which began in 2008 to improve forage production and seasonal wildlife habitat by removing dense, decadent shrubs and replacing them with new grasses, forbs, and mountain shrubs, thus increasing the shrub mosaic and "edge" habitat.
- In addition to the aforementioned WLCI projects (Riverside Stream Enhancement and the Boykin – Encampment River Restoration), additional aquatic habitat projects have/are being conducted on the Encampment River. This is a combined effort with SERCD, TU, and WGFD on approximately 14 miles of the Encampment River addressing reaches from the BLM Oddfellows Campground to the confluence with the North Platte River. The Boykin Reach is just one of four reaches of the river that is targeted for restoration in a larger Encampment River Downstream of Riverside Restoration Project. The larger project area includes Boykin, Peryam, Merrill, and Hillyard reaches and collectively covers approximately 19,000 linear feet. The Peryam Ranch – Encampment River Riparian and Channel Restoration project is a continuation of the restoration completed directly upstream on the Boykin Reach. The project will focus on decreasing river channel width/depth ratios, improving bank stability and channel pattern, and enhancing aquatic and riparian habitats. The Encampment River Fish Passage is a project being led by WGFD, located near the confluence with the North Platte River.

Timeframe: 25 years

Relationship to Existing Plans and Other Actions

- BLM Rawlins Resource Management Plan (Bureau of Land Management, 2008)
- Platte Valley Mule Deer Habitat Assessment
- Platte Valley Habitat Partnership's (PVHP) Mule Deer Habitat Plan (Platte Valley Habitat Partnership, 2013)
- Platte Valley Mule Deer Plan (Wyoming Game and Fish Department, 2012)
- Medicine Bow National Forest Plan (U. S. Forest Service, 1985)
- WGFD Strategic Habitat Plan (Wyoming Game and Fish Department, 2009)

Resource Plans and Other Literature Cited

Allen, D. (2009). *Pinedale Anticline Ground Water Data Summary.* Pinedale, WY: Sublette County Conservation District.

Bates Hole/Shirley Basin Sage-grouse Working Group. (2007). *Bates Hole/Shirley Basin Sage-grouse Conservation Plan.* Wyoming Game and Fish Department.

Bowen, Z. H. (2013). *U.S. Geological Survey science for the Wyoming Landscape Conservation Initiative - 2012 annual report.* U.S. Geological Survey Open-File Report 2014.

Bureau of Land Management. (1997). *Record of decision and Green River resource management plan.* Wyoming: Rock Springs Field Office.

Bureau of Land Management. (2008). *Record of decision and approved Pinedale resource management plan.* Wyoming: Pinedale Field Office.

Bureau of Land Management. (2008). *Record of decision and approved Rawlins resource management plan.* Wyoming: Rawlins Field Office.

Bureau of Land Managmenet. (2010). *Record of decision and approved Kemmerer resource management plan.* Kemmerer, WY: Kemmerer Field Office.

Carbon County Conservation District. (2007). *Long Range and Natural Resource Management Plan 2010-2015.*

Cerovski, A., Gorges, M., Byer, T., Duffy, K., & Felley, D. (2001). *Wyoming Bird Conservation Plan (Version 1.0).* Lander, WY: Wyoming Partners in Flight. Wyoming Game and Fish Department.

Copeland, H., Tessman, S., Hogan, M., Jester, S., Orabona, A., Patla, S., et al. (2010). *Wyoming wetlands: conservation priorities and strategies.* Lander, WY: The Nature Conservancy.

CRCT Conservation Team. (2006). *Conservation agreement for the Colorado River cutthroat trout (Oncorhynchus clarkii pleuriticus) in the States of Colorado, Utah and Wyoming.* Fort Collins, CO: Colorado Division of Wildlife.

Damm, P., & Randall, J. (2012). *Wyoming Range Mule Deer Habitat Management Plan: Big Piney-LaBarge Area.* Pinedale, WY: Wyoming Game and Fish Department.

Dillon, G. K., Knight, D. H., & Meyer, C. B. (2003). *Historic range of variability for upland vegetation in the Medicine Bow National Forest, Wyoming.* Fort Collins, CO: Unpublished report to Medicine Bow National Forest.

Heitmeyer, M. E., Henry, A. R., & Artmann, M. J. (2012). *Hydrogeomorphic Evaluation of Ecosystem Restoration and Management Options for Seedskadee National Wildlife Refuge.* Prepared for U.S. Fish and Wildlife Service, Region 6, Denver CO. Greenbriar Wetland Services Report 12-02. Blue Heron Conservation Design and Printing LLC, Bloomfield, MO.

Lincoln Conservation District. (2010). *Land Use and Natural Management Long Range Plan - 2010-2015.*

Little Snake River Conservation District. (2011). *High Savery annual irrigation release and operating plan.* Little Snake River project design report.

Mule Deer Working Group. (2009). *The Wyoming Mule Deer Initiative.* Wyoming Game and Fish Department.

National Fish and Wildlife Foundation. (2009). *Executive Summary for the Path of the Pronghorn Business Plan.* National Fish and Wildlife Foundation.

NRCS. (2013). *Final Environmental Assessment for the Little Snake River Restoration Project.* USDA Natural Resource Conservation Service.

NRCS. (2013). *Henrys Fork Salinity Control Project Plan and Final Environmental Impact Statement.* USDA Natural Resources Conservation Service.

Pacific Flyway Study Committee. (2002). *Pacific Flyway Implementation Plan for the Rocky Mountain Population of Trumpeter Swans.* Prepared for the Pacific Flyway Council and U.S. Fish and Wildlife Service.

Platte Valley Habitat Partnership. (2013). *Platte Valley Habitat Partnership's (PVHP) Mule Deer Habitat Plan.*

Sawyer, H., Hayes, M., Rudd, B., & Kauffman, M. J. (2014). *The Red Desert to Hoback Mule Deer Migration Assessment.* Laramie, WY: Wyoming Migration Initiative, University of Wyoming.

Senecal, A. C., Gelwicks, K. R., Cavalli, P. A., & Keith, R. M. (2010). *WGFD Short-term Plan for the Three Species on the Green River Drainage of Wyoming; 2009-2014.* Wyoming Game and Fish Department, Fish Division.

Star Valley Conservation District. (2005). *Salt River Watershed Management Plan.* Afton, WY.

Stroud, D. (2010). *Sommers-Grindstone Wildlife Values.* Bureau of Land Management, Wyoming.

Subcommittee on Rocky Mountain Trumpeter Swans. (2012). *Pacific Flyway Management Plan for the Rocky Mountain Population of Trumpeter Swans.* Portland, OR: Pacific Flyway Study Committee (c/o USFWS DMBM), unpublished report.

Sublette County Conservation District. (2010). *Land Use and Natural Management Long Range Plan 2010-2015.*

Sweetwater County Conservation District. (2011). *Land & Resource Use Plan and Policy.*

The Nature Conservancy. (n.d.). *Shirley Basin-Laramie Rivers Conservation Action Plan.* http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/wyoming/howwework/shirleybasin-capbrochure-layout-1-singlepages.pdf: The Nature Conservancy.

The Nature Conservancy. (n.d.). *Places we protect: Shirley Basin.* http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/wyoming/placesweprotect/shirley-basin.xml.

The Nature Conservancy. (n.d.). *Places We Protect: Upper Green River.* http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/wyoming/placesweprotect/upper-green-river.xml.

U.S. Fish and Wildlife Service. (2002). *Seedskadee National Wildlife Refuge Comprehensive Conservation Plan.* Green River, WY and Denver, CO: Seedskadee National Wildlife Refuge and Division of Refuge Planning.

U.S. Fish and Wildlife Service. (2012). *Partners for Fish and Wildlife Program: Mountain-Prairie Region Strategic Plan 2012 - 2016.*

U.S. Fish and Wildlife Service. (2013). *Draft comprehensive conservation plan and environmental assessment, Cokeville Meadows National Wildlife Refuge.* Lakewood, CO: U.S. Department of the Interior, Fish and Wildlife Service, Mountain Prairie Region, 224 p.

U.S. Fish and Wildlife Service. (2013). *Greater Sage-grouse (Centrocerus urophasianus) Conservation Objectives: Final Report.* Denver, CO: U.S. Fish and Willdlife Service.

U.S. Fish and Wildlife Service. (2013). *Land protection plan - Bear River Watershed Conservation Area.* Lakewood, CO: U.S. Department of the Interior, U.S. Fish and Wildlife Service, Regions 1 and 6, 227 p.

U.S. Forest Service. (1985). *Final environmental impact statement for the Medicine Bow National Forest: Land and resource management plan.* Laramie, WY: U.S. Forest Service.

U.S. Forest Service. (1990). *Bridger-Teton National Forest Land and Resource Management Plan.* Jackson, WY: U.S. Forest Service, Bridger-Teton National Forest, Greys River Ranger District.

U.S. Forest Service. (2004). *Greys River Landscape Scale Assessment.* Afton, WY: U.S. Forest Service, Bridger-Teton National Forest, Greys River Ranger District.

U.S. Forest Service. (2005). *Middle Greys River Watershed Assessment.* U.S. Forest Service, Bridger-Teton National Forest, Greys River Ranger District.

Uinta County Conservation District. (2010). *Uinta County Conservation District Long Range Plan.*

Uinta County Conservation District, Blacks Fork/Smiths Fork Water Quality Steering Committee. (2005). *Blacks Fork & Smiths Fork Rivers Watershed Management Plan.*

Uinta County Conversation District, Upper Bear River Water Quality Steering Committee. (2005). *Upper Bear River Watershed Management Plan.* Uinta County Conservation District.

Utah Department of Natural Resources. (2006). *Range-wide Conservation Agreement and Strategy for Roundtail Chub (Gilia robusta), Bluehead Sucker (Catostomus discobolus) and Flannelmouth Sucker (Catostomus latipinnis).* Salt Lake City, UT: Utah Department of Natural Resources, Division of Wildlife Resources.

Wyoming Department of Environmental Quality. (2012). *Wyoming Water Quality Assessment and Impaired Waters List (2012 Integrated 305(b) and 303(d) Report).* Cheyenne, WY: Wyoming Department of Environmental Quality, Water Quality Division.

Wyoming Game and Fish Department. (2009). *Wyoming Game and Fish Department Strategic Habitat Plan.* Wyoming Game and Fish Department.

Wyoming Game and Fish Department. (2010). *State Wildlife Action Plan.* Wyoming Game and Fish Department.

Wyoming Game and Fish Department. (2011). *Wyoming Range Mule Deer Plan.* Wyoming Game and Fish Department.

Wyoming Game and Fish Department. (2012). *Platte Valley Mule Deer Plan v. 110512.*

Wyoming Game and Fish Department. (2012). *Strategic Habitat Plan Accomplishments - 2011 Annual Report.* Wyoming Game and Fish Department.

Wyoming Game and Fish Department. (2013). *Strategic Habitat Plan Accomplishments - 2012 Annual Report.* Wyoming Game and Fish Department.

Wyoming Game and Fish Department. (2014). *Strategic Habitat Accomplishments - 2013 Annual Report.* Wyoming Game and Fish Department.

Young, M. K., Schmal, R. N., Kohley, T. W., & Leonard, V. G. (1996). *Conservation Status of Colorado River Cutthroat Trout. General Technical Report RM-GTR-249.* Fort Collins, CO: USDA Forest Service, Rocky Mountain Forest and Range Experiment Station.